Imperial Bureau of Plant Breeding and Genetics

Plant Breeding Abstracts

Vol. X, No. 1.

(Abstracts Nos 1—258)

School of Agriculture
Cambridge
England

1st January, 1940

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* General studies, see also individual crops.

Plant Breeding Abstracts.

Vol. X, No. 1.

Part 1. Empire Section

BREEDING 575

1. BADAMI, V. K. 575:633(54.8)

Improvement of crops in Mysore. (A review of twenty-five years' work).

J. Mysore Agric. Exp. Un. [1938] : **17** : 113–37, 190–217.

Breeding work and improvements in the cultivation of a large number of crops are dealt with.

With respect to rice, systematic work started in 1929 and extensive selection has been carried out to obtain high-yielding fine varieties. Three new strains, S.169, S.67 and S.236 show promise in this respect and are spreading in cultivation; the latter has a finer grain than the popular G.E.B.24 and is much in demand. Rice varieties for the hill country have also been developed.

Work on sugar cane hybridization started in 1913, attention being devoted to breeding thick, tropical canes suited to local conditions. Many canes were tested as parents, and the vigorous Red Mauritius cane produced many non-arrowing seedlings of great vigour. Mysore conditions require a non-arrowing cane which ripens in 12 months. H.M.320 is a widely grown high-yielding cane of this type with rich juice. H.M.'s 553, 544, 87 and 608 are also grown under particular conditions, but H.M.320 has by far the greatest acreage.

Many fresh seedlings were raised in 1928, promising amongst them being those of the cross H.M.544 x P.O.J.213, which do well on poor soils and in some cases (e.g. H.M.'s 607 and 609) resist drought very well. H.M.'s 606 and 608 are promising inbred seedlings from Striped Mauritius, H.M.608 having a sucrose content of 25–26 per cent with only 0·07 per cent of glucose.

Canes introduced from other sugar cane breeding stations have also been tested under Mysore conditions, and with them mosaic was also introduced. H.M.320 proved highly tolerant to the disease, which has been brought under control. New seedlings from P.O.J.2878 seem quite resistant and are high yielders with a rich juice.

Another line of advance was the use of X-rays to induce bud mutations in local Pattapatti (striped) cane. Some of the mutants were far superior to the parent stock and of a bright golden yellow colour. Other canes similarly treated include Red Mauritius, Q.813 and H.M.'s 320, 544 and 89.

With regard to groundnuts, efforts have been directed to incorporating some of the desirable features of spreading types in bunch varieties. The variety H.G.1, a high yielding erect form highly resistant to leaf spot disease, was developed from a natural cross of Spanish and Big Japan. Many other forms, including the large-seeded variety H.G.2, have been derived from the cross Small Japan x Virginia.

Much breeding work has been done on cotton. Selections of local Sannahatti (*Gossypium herbaceum*) were made at an early stage and the strain S.69 is now the main commercial type. Later crosses were made between *G. arboreum* and *G. herbaceum* in order to develop a cotton equal to Broach in quality. Two valuable strains, H.190 and strain 19, were produced. H.190 has quality quite as good as Broach Deshi 8, has a ginning out-turn of 30 per cent, a staple length of $\frac{7}{8}$ inch to 1 inch and yields nearly as well as local Sannahatti.

Cottons have been bred to replace Bokda, an inferior *neglectum* variety and attention has also been paid to American Upland types. The variety M.A. II, produced by crossing Peruvian tree cotton and the local acclimatized Upland type, Doddahatti, is now widely grown.

A collection of cotton species has been assembled and some interspecific crosses have been attempted in an effort to breed for resistance to red leaf disease.

Efforts to produce X-ray mutants of enhanced economic value have so far failed.

Other crops dealt with in this paper are ragi (*Eleusine coracana*), sorghum, potatoes, castor oil, coconuts, *Cajanus indicus*, wheat, *Cicer arietinum* and other pulses, gingelly, coriander, chillies, coffee, areca nuts, cardamoms, pepper, bananas, mangoes, linseed, oats, barley, tapioca, pineapples, sunflowers and forage plants.

GENETICS 575.1

2. 575.1:061.3

The Seventh International Congress of Genetics.
Nature, Lond. 1939 : **144** : p. 813.

MULLER, H. J. 575.17:576.312.32
Gene and chromosome theory.
Ibid. 1939 : **144** : 814–16.

DARLINGTON, C. D. 576.312
Cytology.
Ibid. 1939 : **144** : 816–17.

MATHER, K. 575:575.1
Plant breeding in the light of genetics.
Ibid. 1939 : **144** : p. 820.

TURRILL, W. B. 575.1:576.12:582
Genetics in relation to evolution and systematics.
Ibid. 1939 : **144** : 822–23.

The above papers give brief accounts of the parts of the programme of the 7th International Congress of Genetics that will be of interest to plant breeders. Abstracts of the papers read at the Congress will be published in the Proceedings in due course.

CYTOLOGY 576.3

3. 576.312.315:576.312.34:581.192.2:635.26

MENSINKAI, S. W. 576.312.315:635.25
The conception of the satellite and the nucleolus, and the behaviour of these bodies in cell division.
Ann. Bot., Lond. 1939 : **3** : 763–94.

The satellite is interpreted as the rolled-up end of the chromosome, and the SAT-filament ("secondary constriction") as a continuation of the chromonema which has been prevented from spiralizing by the presence of the nucleolus.

The mechanism of nucleolus formation and the role of the nucleolus in cell metabolism and the nuclear cycle are discussed.

In the 17 species of *Allium* studied, diploids had two, tetraploids four and hexaploids six nucleoli, except for three diploid species, *A. sativum*, *A. Cepa* and *A. amplectens* with 4, 4 and 6 respectively, and a tetraploid, *A. Bidwelliae*, with ten.

4. 576.312.315:576.312.342:576.356.5
633.18:576.356.5

GATES, R. R. 635.657:576.356.5
Nucleoli, satellites and sex chromosomes.
Nature, Lond. 1939 : **144** : 794–95.

The relationship of satellites to nucleoli is outlined and it is shown that the number of satellites found in species of *Oryza* and in *Cicer arietinum* lends support to the evidence already obtained from studies of secondary association, that these plants are secondarily balanced polyploids with basic numbers of 5 and 4 respectively.

In insects and bryophytes the sex chromosomes are normally those which have satellites or secondary constrictions and are therefore associated with nucleoli.

5. SUTTON, E. 576.356.4:576.356.2:635.656
Trisomics in *Pisum sativum* derived from an interchange heterozygote.
J. Genet. 1939 : **38** : 459–76.
Trisomics originating through numerical non-disjunction in Hammarlund's *K*-line interchange heterozygote are described. Such trisomics were shown to arise by non-disjunction in only one of the four different possible ways, giving only two original types, a tertiary trisomic and a trisomic interchange heterozygote. The extra chromosome is EF (Sansome's nomenclature). On selfing these two types eleven different types may arise, including one new primary trisomic. The single gene ratios expected in the progeny of trisomics derived from interchange heterozygotes are discussed and it is shown to be possible to use these ratios as a means of locating genes in the interchanged chromosomes.

6. KOSTOFF, D. 576.356.5:575.22
Polyploids are more variable than their original diploids.
Nature, Lond. 1939 : **144** : 868–69.
The polyploids studied by the author show much greater variation than the diploids in cell dimensions, number of chloroplasts in stomatal guard cells, plant size, leaf dimensions, flower dimensions, etc. Both allopolyploids and autopolyploids also show greater variation than diploids in the meiotic processes.

7. KOSTOFF, D. 576.356.5:576.312.34:576.12
Evolutionary significance of chromosome size and chromosome number in plants.
Curr. Sci. 1939 : **8** : 306–10.
Autopolyploids with small chromosomes have a greater chance of survival than those with large ones, since the chiasma frequency per chromosome will be lower and trivalent and quadrivalent formation therefore less frequent. Some naturally occurring polyploids are listed and evidence presented that in general they have small chromosomes, usually smaller than those of the corresponding diploids.
Other factors tending to favour small chromosomes in polyploids are: (1) in large nuclei the nuclear surface: volume ratio is reduced, probably with consequent reduction in growth rate; (2) meiotic irregularities are caused by excessive crowding on the plate; (3) zygotene pairing is impeded when homologues are situated far apart in a large nucleus at leptotene.
Alpine conditions may favour polyploidy because the chromosomes are more contracted and the chiasma frequency is reduced.
It is suggested that polyploids of practical importance are most likely to be derived from plants with a low number of small chromosomes.

8. KOSTOFF, D. 576.356.5:581.04
Effect of the fungicide 'Granosan' on atypical growth and chromosome doubling in plants.
Nature, Lond. 1939 : **144** : p. 334.
"Granosan", a proprietary compound containing 2 per cent of ethyl mercury chloride, induced swellings of roots and of whole seedlings of *Secale* and *Triticum* when applied at a concentration of 0·5 to 0·1 per cent for 3 to 6 days. The effect on chromosome behaviour was similar to that of colchicine or acenaphthene.
Chromosome doubling also occurred in root tips of *Pisum sativum* similarly treated, and the agent was more effective with *Pisum* than was acenaphthene.
Germinating seeds treated with "Granosan" are not attacked by fungi, whereas those treated with colchicine are usually severely attacked.

9. BATES, G. H. 576.356.5:581.04:578.08
Polyploidy induced by colchicine and its economic possibilities.
Nature, Lond. 1939 : **144** : 315–16.
The effects and methods of application of colchicine are described. A method used by the author is to make a vertical slit in the stem of a plant or to sever a petiole and immerse the

cut surface in a tube of 0·05 per cent colchicine solution. This has been applied to *Vicia Faba* and *Fragaria.*
It is concluded that colchicine treatment will lead to valuable results in ornamental plants but that its practical significance for crop plants is much more dubious.

PLANT DISEASES AND PESTS 632

10. Newton, M. and
Johnson, T. 632.452:575.242:633.11
A mutation for pathogenicity in *Puccinia graminis tritici.*
Canad. J. Res. 1939 : **17** : Sect. C : 297–99.
A mutant form found in a uredial culture of race 52 proved to be a new form of the fungus, designated as race 178.

11. Georgi, C. D. V. and
Teik, G. L. 632.951.1:575:581.165.1:581.192.6(91)
Preliminary results of analysis of clonal types of Derris under field conditions.
Malay. Agric. J. 1939 : **27** : 302–31.
Considerable variation was observed in yield of roots, rotenone content and ether extract between different plants of the same clone, both in *D. malaccensis* var. *sarawakensis* and *D. elliptica* var. Sarawak Creeping. The latter form seems most promising commercially, but superior clones of both are being propagated on a large scale. In the case of *D. elliptica* a selected clone has given an average yield of 23·04 oz. of marketable root per plant with a rotenone content of 7·78 per cent and an ether extract of 24·73 per cent.
An editorial comment on this article appears on pp. 300–01.

ECONOMIC PLANTS 633

12. Garrett, S. D. 633–2–1.521.6:575
Losses to world agriculture through root disease of crops.
Chem. Ind., Lond. 1939 : **58** : 953–58.
An account of root diseases and of the methods used for their control, including the breeding of resistant varieties.

13. Kenway, C. B. and 633–2.112–1.521.6:578.08
Peto, H. B. 633.11–2.112–1.521.6
Researches on drought resistance in spring wheat. I. A machine for measuring the resistance of plants to artificial drought.
Canad. J. Res. 1939 : **17** : Sect. C : 294–96.
An illustrated account of certain improvements made to the "chinook" machine of O.S. Aamodt (cf. "Plant Breeding Abstracts", Vol. VI, Abst. 12).

CEREALS 633.1

14. 633.1–2.4–1.521.6:575(71)
Simmonds, P. M. 633.1–2.4:581.43:016
A review of the investigations conducted in western Canada on root rots of cereals.
Sci. Agric. 1939 : **19** : 565–82.
This review contains references to breeding work for resistance to root rots, work which has been summarized in "Plant Breeding Abstracts" from time to time. There is a bibliography of 134 references.

WHEAT 633.11

15. WENHOLZ, H., PRIDHAM, J. T., VEARS, C. K. and CURTEIS, W. M. 633.11:575(94) 633.11–2.452–1.521.6

Wheat varieties in Australia.

Agric. Gaz. N.S.W. 1939 : **50** : 308–11, 361–65, 417–20.

This article, referred to in "Plant Breeding Abstracts", Vol. IX, Abst. 912, is being continued serially. On pp. 417–20 particular reference is made to the varieties Eureka* and Eureka 2, both bred by S. L. Macindoe from the cross (Kenya Crossbred C 6040 x Florence) F_1 x Dundee. Eureka is highly resistant to stem rust and moderately so to flag smut. It is early-maturing and gives flour of very good baking quality. It was first distributed in 1938. Eureka 2, distributed in 1939, mainly differs from Eureka in being of midseason maturity and in having stronger straw.

16. PRIDHAM, J. T. 633.11–2.452–1.521.6:575.127.2(94)

A successful cross between *Triticum vulgare* and *Triticum timopheevi*.

J. Aust. Inst. Agric. Sci. 1939 : **5** : 160–61.

Although considerable sterility was encountered in earlier generations, it was possible to obtain in the F_5 of a cross of *T. vulgare* var. Steinwedel x *T. Timopheevi*, wheats of *T. vulgare* type showing apparent immunity to both leaf and stem rust. It is not yet known whether these hybrids are resistant to any of the other diseases and pests to which *T. Timopheevi* shows resistance.

RYE 633.14

17. PURVIS, O. N. 633.14:575.11"793"

Studies in vernalisation of cereals. V. The inheritance of the spring and winter habit in hybrids of Petkus rye.

Ann. Bot., Lond. 1939 : **3** : 719–29.

The F_1 of Petkus winter rye x Petkus spring rye showed complete dominance of the spring habit. In F_2 there was a 3 : 1 segregation of spring and winter forms but in each class there was a much greater spread in flowering date than in the parents. This, it is suggested, may be due to independent segregation of genes for earliness.

18. 633.14:581.481:576.356.5
633.14:575.061.634

KOSTOFF, D. 633.11:581.481:576.356.52

The frequency of polyembryony and chlorophyll deficiency in rye.

Curr. Sci. 1939 : **8** : 356–58.

Among 20,393 seedlings of rye, 5 pairs of twins and one triplet were found. All ten twin seedlings and the two triplets that were studied cytologically were diploids. In 39,606 seedlings of *Secale cereale* type derivatives of a *S. cereale* x *S. montanum* hybrid there were 32 pairs of twins. Of these, 59 plants were diploids, one was triploid, one a diploid structural heterozygote and three were not examined.

The absence of haploids in the above seedlings is striking and presumably due to the fact that they are inviable in a cross-fertilized plant such as rye.

It is considered most likely that the above diploid twins arose from a fertilized egg and a fertilized antipodal cell, and that the triploid arose from an endosperm cell.

The triploid showed 0 to 5 trivalents during meiosis and had 68 to 84 per cent of abortive pollen. Eight grains were set from 432 flowers on open pollination, and none in two spikes that were bagged.

Thirty-four of the above 60,000 rye seedlings were albinos.

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* Abstractor's note. Not to be confused with the variety Eureka described in "Plant Breeding Abstracts," Vol. VII, Abst. 941, which is quite distinct.

In a comparative study of wheat, 18,275 seedlings were found to include four pairs of twins. One of each of two of these pairs was haploid, the other six seedlings being diploid. Haploid plants were smaller than normal, and showed 0 to 3 bivalents at meiosis, 0 to 1 bivalents being usual.

BARLEY 633.16

19. 633.16:575(42)

Visit of the Institute of Brewing to the Plant-Breeding Institute, Cambridge University, on July 14th.

J. Inst. Brew. 1939 : **45** : 467–68.

The barley breeding work in progress in Cambridge is briefly described.

The Danish varieties Kenia and Maya, notable for their short straw and high resistance to lodging, have been extensively crossed with the best modern English varieties and also with outstanding older barleys such as Archer, Spratt and Goldthorpe. The progenies have not yet reached an advanced stage but many are very promising agronomically.

Segregates from the cross Archer-Goldthorpe x Spratt-Archer show high promise as malting barleys.

Efforts are being made to produce winter-hardy two-rowed barleys with good straw, yield and malting quality. In six-rowed forms, it is hoped to increase yield by breeding for higher ear survival rates, and efforts are concurrently being made to obtain more winter resistance combined with good straw.

20. 633.16:575:581.6(42)

HUNTER, H. 633.16:519.241.1:581.192:581.48:631.557

Various aspects of malting barley breeding.

J. Inc. Brew. Guild 1939 : **25** : 177–92.

A reprint of the article summarized in "Plant Breeding Abstracts", Vol. IX, Abst. 1293.

MILLETS AND SORGHUM 633.17

21. 633.171:537.531

KUMAR, L. S. S. and 633.71:537.531

JOSHI, W. V. 635.439:537.531

Experiments on the effect of X-ray on *Pennisetum typhoideum* Rich., *Nicotiana tabacum* Linn. and *Brassica juncea* Hk. f and T.

Indian J. Agric. Sci. 1939 : **9** : 675–84.

The direct effect of X-raying the seeds of *P. typhoideum, B. juncea* and *N. Tabacum* on the vigour and yield of the resulting plants was studied.

22. 633.171:575.11.061.6:581.48

PATEL, Z. H. 633.171:575.183

Occurrence of xenia in pearl millet (*Pennisetum typhoideum*) Stapf and Hubbard.

Curr. Sci. 1939 : **8** : 363–64.

In an African pearl millet, golden yellow seed was found to be a simple monogenic dominant to light bluish green.

Plants of an Indian variety with bluish green seeds growing near the yellow-seeded African types were found to have ear heads bearing some yellow seeds. This was a case of xenia due to natural crossing with the African type. Yellow grains from this source were all of hybrid origin and their progeny segregated in 3: 1, 9: 7 and 2–2·5: 1 ratios. Three factors are involved and their inheritance is to be dealt with in a later paper.

23. RANGASWAMI AYYANGAR, G. N. 633.174:575.11:581.4

Studies in sorghum.

J. Madras Univ. 1938 : **11** : 131–43.

The mode of inheritance of a large number of characters in sorghum (most of which have previously been dealt with in papers summarized in "Plant Breeding Abstracts") is described.

The significance of genetic studies in determining morphological homologies between different plant organs is discussed. Among such homologies indicated by genetical work in sorghum are stigma and awn, leaf and glume, and the callus at the base of the first glume and the nodal band of the leaf-sheath.

24. Rangaswami Ayyangar, G. N. and Ponnaiya, B. W. X. 633.174:575.11:581.46
Cleistogamy and its inheritance in sorghum.
Curr. Sci. 1939 : **8** : 418–19.

Cleistogamous lines were found in *Sorghum papyrascens* Stapf. Cleistogamy occurs in plants with papery (*py*) glumes and is determined by a single gene, *gx*, which is recessive and which leads to a rolling-in of the edges of the glumes. The gene, *gx*, is not expressed in plants with coriaceous (*PY*) glumes.

25. Rangaswami Ayyangar, G. N. and Venkataramana Reddy, T. 633.174:575.11.061.5:581.49:581.45 633.174:575.116.1
The occurrence and inheritance of hairiness of leaf tip in sorghum.
Madras Agric. J. 1939 : **27** : 210–14.

Hairy leaf tip is a simple monogenic dominant to glabrous. It is linked to feathering of the tip of the stigma and to the presence of awns with 25 per cent and 43 per sent of crossing-over respectively. Presence of awns and feathering of stigmatic tips show about 18 per cent of crossing-over.

The above three factors are all inherited independently of the *P* factor for leaf sheath colour, the *W* factor for pericarp colour and hairiness of the nodal band.

26. Rangaswami Ayyangar, G. N. and Kunhi Koran Nambiar, A. 633.174:575.242:575.113.7
Lethal green seedlings in sorghum.
Curr. Sci. 1939 : **8** : 417–18.

A monogenic recessive lethal in which the seedlings are stunted but have a normal green colour is described. The type occurred as a mutant in *Sorghum caudatum* Stapf. The gene concerned is designated *ce.*

RICE 633.18

27. Hamid, S. and Baker, J. A. 633.18:581.148:581.46:578.08
Notes on an attempt to estimate threshing qualities in padi.
Malay. Agric. J. 1939 : **27** : 269–70.

A device is described and illustrated with which it is possible to estimate the ease with which rice varieties shatter or thresh.

ROOTS AND TUBERS 633.4

28. Davey, V. McM. 633.42:575.127.2:635.3:581.162.5:631.521.5
Hybridization in Brassicae and the occasional contamination of seed stocks.
Ann. Appl. Biol. 1939 : **26** : 634–36.

A discussion of inter-specific and inter-varietal compatabilities within the genus *Brassica.* Some of the hybrids are described.

FIBRES 633.5

29. 633.51:575(54)
Summary proceedings of the thirty-ninth meeting of the Indian Central Cotton Committee, Bombay, held on the 31st March, 1939.
Pp. 28.

This report includes an outline of the work done in Sind on the breeding of long staple cottons, and gives details of a new scheme for future breeding work.

30. MEHTA, C. V. 633.51:575(54)
Cotton growing. Trend of development.
Times Engng. Suppl. 1939 : **44** : p. xliii.
Improvements in the cotton growing industry in India during the last 15 years are reviewed, with particular reference to the significance of plant breeding work in producing varieties of enhanced yield and staple length. Average yield per acre is shown to have increased by 14 per cent when the period 1923–28 is compared with 1933–38, an increase due to improvements in both cultivation and variety. The task of still further increasing the area under staple cotton capable of spinning at least 20's standard warp count is regarded as one of the chief objectives of cotton breeding in India.

31. SAWHNEY, K. 633.51:575(54.9)
Cotton growing in Hyderabad State. Volume 1 (Being a report on a survey of the cotton crop 1931-35).
Indian Cent. Cott. Comm., Bombay [1939] : Pp. 90.
This report gives an account of the methods of cotton cultivation in Hyderabad State and of the botanical composition of the varietal mixtures grown. The main types growing in these mixtures are described. In the last chapter recommendations are made for the future conduct of breeding work in the State.

32. HARLAND, S. C. 633.51:575:578.08
Some comments on Dr. Mason's article "A note on the technique of cotton breeding".
Emp. Cott. Gr. Rev. 1939 : **16** : 186–93.
In commenting on the article summarized in "Plant Breeding Abstracts" Vol. VIII, Abst. 1042, the author points out that the chief cause of failure in cotton breeding in the British Empire is not the failure of genetics as an aid to the breeder, but environmental conditions unsuited to cotton cultivation.
The methods of breeding recommended by the author are outlined; he places little reliance on field selection but advocates the growing of the largest manageable number of short progeny rows. The back-cross method and compound hybridization are also recommended.
With regard to Sir G. Evans' note on Dr Mason's article (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1042), the author points out that changes in varietal characteristics that have occurred when cotton varieties have been grown in new climates were due to heterozygosity.

33. 633.51:581.6:578.08
Halo-length measurement.
Emp. Cott. Gr. Rev. 1939 : **16** : 272–75.
A reprint of an article entitled "The desirability of interchange of details of methods employed in measuring 'halo lengths' at different experiment stations" by M. A. Bailey, originally published in the same journal in 1931, with an editorial note in which it is stated that the graduated scale advocated by Bailey may be obtained from the Empire Cotton Growing Corporation.

34. 633.51.00.15(41)
633.51:575(41)
Report of the Administrative Council of the Corporation submitted to the Eighteenth Annual General Meeting on May 19th, 1939.
Rep. Emp. Cott. Gr. Corp. (1937–1938) 1939 : Pp. 55.
The parts of this report that are of interest to plant breeders are dealt with at greater length in the report summarized in "Plant Breeding Abstracts", Vol. IX, Abst. 1307.

35. WILLIAMS, C. H. B. and CAMERON, C. 633.61:575(88) 633.61:575.127.5
Field experiments with sugar cane, VIII.
Sug. Bull. Dep. Agric. Brit. Guiana 1939 : No. 8 : Pp. 108.
Further variety trials are described. Among the new canes in the early stages of testing, the following hybrids of Diamond 10 outyielded the standard, P.O.J.2878: D's 419/33, 34/33, 8 33, 30 33 and 39 33. Further tests on these varieties and other similar ones are in progress. The P.O.J.2878 x sorghum hybrid, D.166 34, has only been tested to a limited extent but has outyielded P.O.J.2878 and is so promising that it is being increased and distributed to estates.

36. VENKATRAMAN, T. S. 633.61:575.127.5:633.289
Sugar cane x bamboo hybrids.
S. Afr. Sug. J. 1939 : **23** : 447–49.
The substance of this paper has been summarized in "Plant Breeding Abstracts", Vol. IX, Absts. 609, 610 and 1533.

37. L....., H. M. 633.61–1.524:575
Collecting wild forms of sugar cane.
Int. Sug. J. 1939 : **41** : 377–79.
A discussion of the purposes and problems of collecting wild sugar cane varieties, with particular reference to the paper by Brandes, Sartoris and Grassl summarized in "Plant Breeding Abstracts", Vol. IX, Abst. 1536.

38. L....., H. M. 633.61–2–1.521.6:575
Varietal problems of the sugar cane.
Int. Sug. J. 1939 : **41** : 335–37.
A review of varietal and breeding problems in sugar cane, in which papers delivered at the 1938 Congress of the International Society of Sugar Cane Technologists are discussed. These papers have been summarized in "Plant Breeding Abstracts", Vol. IX.

39. STEVENSON, G. C. 633.61–2.3–1.521.6:575(69.82)
The inheritance of gumming disease resistance in sugarcane breeding.
Bull. Sugarcane Res. Sta., Mauritius 1939 : No. 15 : Pp. 9.
The resistance to gumming disease of the various important original varieties of noble canes is indicated. These include canes of the Otaheite (Bourbon) group (very susceptible), Cheribon group (moderately resistant), the Cavengerie (highly resistant) and the Tanna group (almost immune). There is therefore a great range of resistance in modern noble canes descended from the above. The wild species used in the production of hybrids are highly resistant and their resistance is apparently dominant in crosses.
Inheritance in complex polyploids such as sugar cane is not simple, but the following relations are noted. From noble crosses the mean percentage of resistant seedlings was 76·6, for crosses involving P.O.J.2878 it was 90·0, and in the case of crosses of Uba Marot all the progeny were resistant.
Gumming disease resistance trials are a normal feature of cane breeding in Mauritius and susceptible segregates are discarded.

40. FENNAH, R. G. 633.61–2.7–1.521.6(72.98)
A summary of experimental work on varietal resistance of sugarcane to *Tomaspis saccharina* 1936-39.
Trop. Agriculture, Trin. 1939 : **16** : 233–40.
Olfactometric experiments and morphological studies in Trinidad indicate that the apparent resistance of such types as Uba and Co. 213 to *Tomaspis* (as compared with the relative

susceptibility of BH.10 (12), B.147, etc.) is not due to any morphological factor but to differences in the attractiveness of the odours of the different varieties to the insect. Apparent "resistance" is therefore likely to be due merely to the growing of more attractive cane varieties on a near-by plot and a "resistant" variety would probably fare no better in a large stand than a "susceptible" one.
It has not yet been possible to study differences between varieties in their ability to tolerate attack and to recover from it.

STIMULANTS 633.7

41. Kostoff, D. 633.71:576.356.2:575.247:576.354
Abnormal mitosis in tobacco plants forming hereditary tumours.
Nature, Lond. 1939 : **144** : p. 599.

In amphidiploid *Nicotiana glauca* x *N. Langsdorffii* (= *N. Vavilovii*), a type which forms hereditary tumours at an age of 4 to 7 months, abnormal mitoses were observed in root tip sections. In five plants studied, from 4·2 to 21·4 per cent of cells showed at least one chromatin bridge at mitotic anaphase.
In amphidiploid *N. rustica* x *N. glauca*, which does not form tumours, 3·4 per cent of cells in the one plant studied had chromatin bridges.
It is suggested that tumour formation is due to disturbance of genic balance caused by somatic interchanges between non-homologous chromosomes. This hypothesis is supported by the fact that 12 to 18 per cent of plants in some lines of *N. Vavilovii* have mutant shoots.

42. 633.71:576.356.4:576.312.34
Goodspeed, T. H. and 633.71:576.354.4:576.356.5
Avery, P. 633.71:575.242
Trisomic and other types in *Nicotiana sylvestris*.
J. Genet. 1939 : **38** : 381–458.

Primary trisomics of 11 of the 12 possible types have been recognized and are fully described. They were obtained chiefly by irradiation, from plants with a recessive asynaptic gene or from the F_1, triploid x diploid. The transmission of the different extra chromosomes in the progeny of trisomics was studied. They passed into 0 to 34 per cent of the progeny through the pollen, the average being 9·9 per cent, while through the ovule the average transmission was 23·5 per cent and the variation was small (these figures refer to back-crosses to the diploid).
It was possible by careful observation to distinguish each of the 12 chromosomes of *N. silvestris*, and in some cases to determine which chromosome was triplicated in a given primary trisomic. Nucleolar behaviour is described in some detail. Meiosis in two abnormal haploids is also described, and comparisons are made between chromosome behaviour in the diploid, triploid and tetraploid.
It is concluded in general that in each trisomic all organs of the plant are affected in the same direction and this is attributed to the physiological action of the extra chromosome as a whole and not to the triplication of any specific genes in it. The normal diploid shows a balance between the characters of the different trisomics in all respects.
In addition to the above 11 types others were found, including types with a chromosome fragment, 9 different tertiary trisomics, 6 different tetrasomic types and 26 different double trisomics. An analysis of some of these types was made.
Three monogenic recessive mutations are described—"asynaptic", "low stigma" and "bunchy". The asynaptic condition is much affected by environmental influences, the effect being greatest with high temperature and low humidity.
A tetraploid plant heterozygous for the "bunchy" gene originated by zygotic doubling and a 35 : 1 ratio was obtained on selfing. There was much genetic variation in the tetraploid progeny.

43. 633.73:575(67·8)
633.73.00.14:581.165.1(67.8)

Quarterly notes of the Coffee Research and Experiment Station, Lyamungu, Moshi.

Dep. Agric. Tanganyika, June, 1939 : No. 10 : Pp. 15.

A large trial has been started to compare the seedling progenies of 78 selected coffee trees, and a comparative trial of selected coffee clones is projected. Clones and seedling progenies obtained from the same tree are also to be compared.

44. KRUG, C. A. and CARVALHO, A. 633.73:581.483:575.11.061.6

Genetical proof of the existence of coffee endosperm.

Nature, Lond. 1939 : **144** : p. 515.

Crosses were made between a yellow-seeded mutant of *Coffea arabica* known as "Cêra" and normal green-seeded plants. In the F_1 of Cêra x green-seeded the nutritive tissue of the seed was green, indicating that it is true endosperm. The green-seeded type is fully dominant in the endosperm even when used as the male parent.

45. 633.73–2–1.521.6:575(67.62)
633.73.00.14(67.62)

Annual report of the board for the year ended 30th June, 1939.

Coffee Bd Kenya 1939 : Pp. 57.

Further selection of coffee trees resistant to Elgon die-back has been done and the crops of the selections are being recorded for yield and quality. Variety tests for resistance to coffee berry disease are being carried out and in the Nandi district some 56 trees have been selected as being at least moderately resistant and are being individually recorded. Four trees resistant to leaf disease have also been selected and two of them are being propagated vegetatively for trial in regions where the disease is prevalent.

Variety trials are being carried out at various stations, and some 4,000 individual trees are being recorded.

46. VOELCKER, O. J. 633.74:575.125(66.9)

Growth rate of cross and self-fertilized cacao.

Trop. Agriculture, Trin. 1939 : **16** : 203–05.

There was no evidence of hybrid vigour in the cross-fertilized progeny of 10 Nigerian cacao selections when compared with self-fertilized progenies of the same trees. It is therefore concluded that seed from isolated monoclone plots may be distributed with confidence, though at the same time it is pointed out that crosses between more dissimilar parents might lead to the appearance of heterosis.

47. COPE, F. W. 633.74:581.162.5

A note on the range of compatibility in cacao.

8th Annu. Rep. Cacao Res., Trin. (1938) 1939 : 16–17.

Considerable and characteristic differences between self-compatible trees in the percentage of cherelles set were found. The modal value of the set was about 40 per cent, but in some trees it exceeded 70 per cent. There was a considerable class of trees with very low fruit set and these trees were classed as self-incompatible for the purposes of other experiments.

48. COPE, F. W. 633.74:581.162.5

Compatibility and fruit setting in cacao.

8th Annu. Rep. Cacao Res., Trin. (1938) 1939 : 17–20.

Selfings of self-incompatible trees gave a 1·02 per cent set of cherelles, crosses between different self-incompatible trees gave a 2·43 per cent set and self-incompatible x self-compatible crosses gave a set of 32·2 per cent. There was evidence that the intensity of pollination throughout the plots was fairly uniform and that a self-incompatible tree did not depend solely on the pollen of immediately adjacent self-compatible trees.

49. Cope, F. W. 633.74:581.162.5:581.331.2
Studies in the mechanism of self-incompatibility in cacao. I.
8th Annu. Rep. Cacao Res., Trin. (1938) 1939 : 20–21.
In the cases studied, pollen in incompatible matings was able to grow just as quickly down the style as pollen in compatible matings.

50. Cope, F. W. 633.74:581.162.5:631.557(72.98)
Some factors controlling the yield of young cacao. II.
8th Annu. Rep. Cacao Res., Trin. (1938) 1939 : 4–15.
A further report of the work described in "Plant Breeding Abstracts", Vol. IX, Abst. 73. On the basis of new data it is shown that self-incompatible cacao trees produce on the average almost twice as many flowers as self-compatible ones, but the proportion of cherelles set was about three times as high in self-compatible trees. Cherelle wilt was higher in self compatible trees but the final number of pods harvested per tree was 7·5 for compatible and 4·4 for incompatible. It is estimated on the basis of these experiments that self-incompatibility in the blocks accounted for a loss in yield of some 24 per cent.
The difference between the two types of tree appears to be greatest on poor soils; it varied from 3·6 to 89·4 per cent in the different blocks of the experiments.

51. Hatton, R. G. and
Beard, F. H. 633.79:575(42)
A report of hop research work at East Malling Research Station.
J. Inst. Brew. 1939 : 45 : 556–59.
The work in hand includes clonal selection within commercial varieties and the testing of new varieties bred by Prof. Salmon at Wye College. Testing for resistance to *Verticillium* wilt is also carried out; no variety has yet proved resistant.

AROMATIC PLANTS 633.8

52. Deshpande, R. B. 633.842:575.247.061.634
A case of variegation in *Capsicum annuum* L.
Curr. Sci. 1939 : 8 : 313–14.
A chlorophyll-deficient sectorial chimaera was discovered. Progeny from the green branches were all normal, while those from chlorophyll-deficient branches were themselves chlorophyll-deficient and died in a few days. Hybrid seedlings were normal green and it is considered likely that the mutant condition is a monogenic recessive.

RUBBER PLANTS 633.91

53. 633.912:575(54.8)
633.912:581.165.71
Report of the work of the Rubber Research Board in 1938. (Established under Ceylon ordinance No. 10 of 1930).
Rubb. Res. Scheme (Ceylon) March, 1939 : Pp. 100.
Test plots of about 40 new clones are to be established in 1939. These will mostly be derived from high-yielding mother trees grown from Tjikadoe seed.
Studies of the stock: scion relationship were continued. It was found that the effect of the stock on girth of the scion was low and of doubtful significance. The effect on yield was important only as tapping approached within about 15 inches of the union of stock and scion. There was no significant difference in yield between a clone budded on mixed stocks and budded on seedlings derived from uncontrolled pollination of the same clone.
Test tapping of clones has been continued (cf. Abst. 56 below).
New breeding work is to include controlled crosses between high-yielding Ceylon clones and imported clones known to be valuable as seed parents.

54. 633.912:575:578.08

Buddings and clonal seedlings.

1st Quart. Circ. Ceylon Rubb. Res. Scheme 1939 : **16** : 32–40; also Rubb. Res. Inst. Plant. Bull. 1939 : No. 2 : 1–7.

A brief discussion of the various methods of developing high-yielding planting material in the case of rubber.

55. MANN, C. E. T. 633.912:575:581.163:631.521.1(91)

Recommendations on the choice of planting material, clones and clonal seedlings.

J. Rubb. Res. Inst. Malaya 1939 : **9** : 79–88; also 14th Annu. Conf. Inc. Soc. Plant Penang 23rd to 25th September, 1938.

Reprints of the article summarized in "Plant Breeding Abstracts", Vol. IX, Abst. 624.

56. FORD, C. E. 633.912:581.165.1:575(54.8)

Ceylon clones VII. (1938).

1st Quart. Circ. Ceylon Rubb. Res. Scheme 1939 : **16** : 1–11.

O'B . . ., T. E. H.

Planting notes. Promising local clones.

Ibid 1939 : **16** : 19–20.

This is a further report of the test tappings of Ceylon rubber clones.

Though none of the clones is yet "proved", some are very promising and facilities are being provided for the sale of small quantities of budwood to estates for further testing. Among the most notable clones mentioned are Millakande 1/1, 4 3 and 3/2, Hillcroft 28, Wagga 6278, Beau Sejour 3 and Diyaberiyakande 1.

FRUIT TREES 634

57. 634:576.16

GILL, N. T. 635:576.16

The origins of our garden crops.

Gdnrs' Chron. 1939 : **105** : 356, 390, 406.

In concluding this article, the first part of which was summarized in "Plant Breeding Abstracts", Vol. IX, Abst. 949, the author deals with the following crops: the onion group, peas, beans, Jerusalem artichoke, lettuce, spinach, cucumber, tomato, potato, melon, fig and a number of cultivated pome and stone fruits and berries.

NUTS 634.5

58. HUMPHREY, N. 634.58–2.484–1.521.6:575.42(67.62)

A groundnut wilt disease on the coast of Kenya.

E. Afr. Agric. J. 1939 : **5** : 110–13.

A creeping variety of groundnut from Nyanza was found to possess some resistance to *Fusarium* wilt, and selection within this variety for a number of years has led to the production of types with satisfactory field resistance.

Of other varieties tested, only one, Akola 10, showed sufficient promise to be retained for further trial.

PALMACEOUS AND OTHER TREE FRUITS 634.6

59. 634.61:575(54.8)

Report and accounts of the Coconut Research Scheme for 1938.

Sess. Paper XI Coconut Res. Scheme, Ceylon 1939 : Pp. 22.

On the Bandirippuwa Estate yield recording has continued and there are now 76 proved high yielding palms (average annual yield of over 100 nuts) on the estate. Seed nuts and seedlings from selected palms and high-yielding blocks are supplied on a large scale, but the supply is still insufficient.

Coconut and oil palm seeds imported from Papua and Malaya respectively were planted for trial. An experiment is to be laid down at the Ratmalagara estate to compare seedlings (both selected and unselected) from (*a*) high yielding and (*b*) low yielding mother palms, and (*c*) from unselected bulk. Trials of coconut and oil palm varieties are also being laid out.
Yield recording is now being carried out on a total of ten estates and it is hoped to increase this number further in 1939.

SMALL BUSH FRUITS 634.7

60. 634.75:576.16
BUNYARD, E. A. 634.75–2.8–1.521.6:631.524:575
The strawberry and its history.
Gdnrs' Chron. 1939 : **105** : 154–55.

In tracing the history of the strawberry, the author concludes that all modern large-fruited varieties have *Fragaria chiloënsis* in their ancestry. He suggests that all available forms of the latter species should be collected with a view to breeding new varieties resistant to virus, and also considers it possible that Alaskan forms of the species may be very cold-resistant.

OTHER FRUITS 634.77

61. GROSZMANN, H. M. 634.774:575.42(94.3)
Pineapple plant selection. With special reference to the elimination of inferior types.
Qd Agric. J. 1939 : **52** : 27–42.

The most commonly occurring undesirable types in the pineapple variety Smooth Cayenne are described. It is suggested that growers should improve their planting material by removing the slips from undesirable plants when the fruit is partly developed; or more quickly, by growing short progeny rows from selected plants and bulking the desirable progenies as a nucleus of élite planting material.

VEGETABLES 635

62. 635.64:575(42)
635.64.00.14(42)
Burlingham Horticultural Station. Tomato variety trial.
Horticulture, Norfolk C.C. 1939 : **2** : 30–31.

Mention is made of tomato selection from a cross of Potentate x Kondine made by Dr Bewley, which yielded nearly 100 tons per acre in 1937.

63. ASHBY, E. 635.64:575.125:578.08
Correlation between seed weight and 'adult' weight in tomatoes.
Nature, Lond. 1939 : **144** : p. 712.

LUCKWILL, L. C.
Heterosis in *Lycopersicum* crosses in relation to seed weight.
Ibid. 1939 : **144** : p. 908.

It is shown that transplanting may destroy any correlation between seed weight and adult plant weight in experiments on heterosis in tomatoes and it is suggested that Luckwill's experiments (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 960) may have been invalidated by this fact.
In a reply to Ashby's criticism, Luckwill states that in his experiments correlations between seed weight and the weight of the plant had disappeared before transplanting took place and, secondly, that there was a strong correlation between the dry weight of plants before and after transplanting.

64. 635.64–2.484–1.521.6:575.127.2(94.4)

Disease resistant tomatoes.

Agric. Gaz. N.S.W. 1939 : **50** : 368–69.

The development of disease-resistant types is one of the main features of tomato breeding in New South Wales. Crosses with *Lycopersicon pimpinellifolium* have been made to impart resistance to *Fusarium* and spotted wilts, but so far no satisfactory commercial type has been so obtained.

65. Wenholz, H. 635.64–2.8–1.521.6:575(94.4)

Spotted wilt of tomatoes. Breeding for resistance.

Hawkesbury Agric. Coll. J. 1939 : **36** : p. 103.

Reference is made to the work being conducted by N. S. Shirlow on breeding tomatoes resistant to spotted wilt. Hybrids of cultivated types with *Lycopersicon pimpinellifolium* are being bred and another apparently immune Peruvian species is under observation. The cultivated variety Antibes and a few others have so far remained free from the disease at the Hawkesbury Agricultural College.

66. Bose, R. D. 635.652:575.11

Studies in Indian pulses, IX. Contributions to the genetics of *mung* (*Phaseolus radiatus* Linn. syn. *Ph. aureus* Roxb.).

Indian J. Agric. Sci. 1939 : **9** : 575–94.

In a cross between Pusa Type 18 and Type 36, olive yellow flowers and shining seed surface behaved as simple recessives to light yellowish olive flowers and dull seed surface respectively. Dark green colour of the seed-coat was dominant to pale lemon yellow and a 9 : 3 : 3 : 1 ratio was obtained in F_2, the intermediate classes being green and greenish yellow. Type of seed surface and seed-coat colour were found to be inherited independently.

Inheritance of maturity, length of ripe pods and diameter of pods was also studied and it is stated that multiple factors are probably involved. B. P. P.

Part II. Foreign.

STATISTICS 519

67. Zubin, J. 519.24
Nomographs for determining the significance of the differences between the frequencies of events in two contrasted series or groups.
J. Amer. Statist. Ass. 1939: **34**: 539–44.

The statistical method for finding the significance of the difference between two proportions, or between the frequencies of an event in two contrasted groups, is made the basis of a nomograph test. Two charts, entered respectively with the proportions and the sample sizes, give the difference, on a transformed scale, together with its standard error, and the significance can be determined at once. J. W.

68. Justesen, S. H. 519.24:631.421
Toepassing van de strooiingsanalyse bij vakkenproeven. (**Application of the analysis of variance in field experiments**).
Landbouw 1939: **15**: 346–63.

This paper, which contains a short exposition of the principles of field experimentation and the analysis of variance, is intended for officers of the Extension Service in the Netherlands East Indies who are not acquainted with statistical methods, though engaged in carrying out and controlling experiments.

69. Day, B. B. and
Austin, L. 519.24:631.421:634.975
A three-dimensional lattice design for studies in forest genetics.
J Agric. Res. 1939: **59**: 101–19.

A detailed description is given of the lay-out and arithmetical analysis of the data of a three-dimensional quasi-factorial (or cubic lattice) experiment comparing 729 strains of pine seedlings, 696 of *Pinus ponderosa* and 33 of *Pinus Jeffreyi*. These were arranged in 729 blocks, and with three-fold replication of the varieties in each of three groupings, the replication was nine-fold altogether, comprising 6561 plots. The gain in efficiency over the ordinary randomized block design was shown to be considerable. J. W.

70. Borden, R. J. 519.24:631.421:633.61
Studies in experimental technique. Selection of layout: blocks versus Latin squares.
Hawaii. Plant. Rec. 1939 : **43** : 7–10.

By treating a set of data as a triple Latin square a great reduction was effected in the sum of squares due to error, thus making differences between treatments significant, which were not so when the block was treated as a whole.

71. Wallis, W. A. 519.241.1
The correlation ratio for ranked data.
J. Amer. Statist. Ass. 1939 : **34** : 533–38.

A method which has been developed of using ranks instead of exact measurements isolates the factors which account for variation by means of an analysis of variance of the rank data, and a statistical test of significance is obtained by the calculation of χ^2. It is shown that a measure of the influence, the significance of which is determined in this way, can be obtained very simply from χ^2. This measure is called the rank correlation ratio. J. W.

72. Cochran, W. G. 519.271.3:631.421
The use of the analysis of variance in enumeration by sampling.
J. Amer. Statist. Ass. 1939 : **34** : 492–510.

A description is given of methods of sampling which are designed to secure representativeness and accuracy. An aspect of importance concerns the extraction of information on the

relative precision of various alternative methods of sampling which might have been adopted. This can be done by the use of the analysis of variance technique, and the paper discusses the method and illustrates it by a numerical example. The sampling error of the mean when an appreciable fraction of the population (e.g. more than 10 per cent) is sampled is discussed. Advice is given on the problem of analysing the results of large samples without excessive labour.

J. W.

73. Davis, J. F. 519.271.3:631.421:633.13

A comparison between yields calculated from the grain-straw ratio and those calculated from small cut-out areas.

J. Amer. Soc. Agron. 1939 : **31** : 832–40.

A comparison is made between the relation to the total yields of a number of plots of oats of (1) the yields of a variable number (one to six) of small areas cut from the plots with a hand-sickle and (2) the yields obtained by calculation of the grain-straw ratio of from one to five threshed bundles in association with the bundle weight of the entire plot. It is concluded that the latter method provides more accurate determinations of the plot yields than the method of using area samples when full harvesting for grain yield results is not possible.

J. W.

BREEDING 575

74. Hino, I. 575:578.08:633:581.04

(The variation in resistance to the toxic action of potassium chlorate and its diagnostic application in distinguishing the diseased plants from the healthy).

Agric. & Hort. Japan 1939 : **14** : 1483–86.

It is suggested that plant to plant variations in resistance to the toxic action of potassium chlorate may be used, *inter alia*, as an index to drought resistance and cold resistance and as an indicator of sex in dioecious plants.

75. Åkerman, Å. 575:633(48.5)

Modern växtförädling med särskild hänsyn till Norrbotten. **(Modern plant breeding with special reference to Norrbotten).**

Norrbottens läns hushållningssällskaps möte i Luleå den 27 nov. 1937, Piteå 1938 : Pp. 13.

This lecture contains an account of methods of plant breeding in which the roles of selection, hybridization, increase of the chromosome number, and mutation are discussed, with illustrations drawn from the advances made in Swedish plant breeding especially in regard to cereals. The different requirements of various localities including Norrbotten, are touched upon and the methods by which it is hoped to produce suitable forms of cereals and herbage grasses are mentioned in a brief indication of future problems for Swedish plant breeding. The importance of co-operation between the main research centre and the local breeding stations is stressed.

Among the varieties of various crops produced in recent years are the oat strains L 01320 and L 01341 (= L 29 256), both very promising in earliness and stiffness of straw and both having a relatively high yield. Also the barley strain L 27 234, derived from a land form from Månsbyn, appears likely to be superior to Vega in yield of grain, earliness, stiffness of straw and size of grain.

76. Nilsson-Leissner, G. 575:633(48.5)

Ertragssteigerung durch Pflanzenzüchtung! Schwedische Erfahrungen. **(Increasing yield by plant breeding. Swedish experiences).**

Int. Agrar Rundschau 1938 : 29–34.

The yield increases obtained by breeding various crop plants in Sweden during the last 50 years are estimated. The total annual increased value of the crops due to plant breeding is about 100,000,000 crowns per annum, whereas state expenditure on the breeding work has only been about 7,000,000 crowns during the 50 years. Considerable increases in quality as well as in yield have been obtained.

77. JØRGENSEN, C. A. 575:633(48.9)
Nye fremskridt i arvelighedslæren—Nye veje for planteforædlingen. (**New progress in genetics—New ways of plant improvement**).
Tidsskr. Landøkon. 1939 : No. 10 : 673–89.

In this lecture the difficulties of breeding disease-resistant crops are illustrated by reference to American efforts to produce economically valuable rust-resistant forms of wheat. The technique of determining physiological races of fungi and the aims to be adopted in breeding disease resistant crops are described. In Denmark clover and cabbage are the two most important crops now engaging the breeder's attention as regards disease resistance.
Heterosis is also discussed with an account of its application in the form of double crossing in maize breeding in the U.S.A.
The question of whether heterosis could also be utilized in sugar beet improvement and the practical difficulties of the method are being investigated by the lecturer and V. Lund in Denmark.
Methods of inducing polyploidy and its spontaneous occurrence are considered with reference to its possible economic value in crop improvement.
In the ensuing discussion the question was raised as to the basis on which the inbred lines used in crossing to obtain heterosis should be judged.

78. BROEKEMA. 575:633(49.2)
Over veredeling van landbouwgewassen. (**On the improvement of agricultural crops**).
Erfelijkheid in Praktijk, Leiden 1939 : **4** : 182–83.

The need for winter-hardy wheat and barley in Holland is stressed. The importance of obtaining experimentally substantiated information at an early stage regarding the various characteristics (such as resistance to diseases and cold) of strains of a particular crop is urged and supported by data on the production of wart-resistant potatoes of good quality in Holland. The official measures to promote co-operation among Dutch potato growers to assist in developing resistant strains are stated to be highly promising.
A similar co-operative study of the beans and peas grown in Holland is under way.

79. MÄDE, A. and
RUDORF, W. 575:633:578.08
Zweck und Aufbau moderner bewetterter Gewächshäuser und ihr Temperaturgang im Vergleich mit dem des Freilandes. (**Object and construction of modern greenhouses with controlled climatic conditions and the temperature within them in comparison with the open**).
Bioklimat. Beiblätter 1938 : Heft 4 : 145–53.

Descriptions are furnished of a device whereby undue rise in temperature and humidity in greenhouses can be avoided by passing cold water and air in a regulated stream through the greenhouse, the humidity of which is regulated by a controlled spray of cold water. The same system serves to warm the house in winter.

80. SMIRNOV, V. 575:634(47)
(**Immediate problems of breeding**).
Soviet Subtropics 1939 : No. 10 (62) : 56–58.

An outline is given of the main problems in breeding subtropical fruit trees and other crops. Among the possibilities suggested are the production of triploid lemons with the object of obtaining seedless forms, bud selection for the production of early maturing, high yielding citrus sports and inter-specific crossing in tung to produce forms adapted to local conditions.

81. Wellensiek, S. J. 575.1:633:061.3
Indrukken van het zevende internationale genetische congres in Engeland. **(Impressions of the Seventh International Genetic Congress in England).**
Erfelijkheid in Praktijk, Leiden 1939 : **4** : 177–80.
An account of the congress and pre-congress tours of the participators with the author's impressions and critical observations on the work of the various scientific and other institutes visited and the aims and results of the congress.

82. Wilczyński, J. 575.114:519.24
Über die allgemeine Gleichung der Mendel-Gesetze. Zum Teil ein Beitrag zur Deutung des Dominanzwesens. **(On the general equation of the Mendelian laws. In part a contribution to the interpretation of the nature of dominance).**
Biol. Gen. 1939 : **14** : 447–55.
It is shown that the number of genotypes in the F_2 of a cross can be expressed according to the expansion of the Newton binomial $(2 + 2)^n$, where n is the number of gene differences. When dominance occurs however the number of phenotypes is less than the number of genotypes, the two being in the proportion 2 : 3 in monohybrid, 4 : 9 in dihybrid, 8 : 27 in trihybrid and so on, i.e. in the relation $2^n : 3^n$. The number of genotypes occurring in the dominant phenotypic group can again be expressed as an expansion of $(1 + 2)^n$. Dominance has therefore no influence on the segregation of the genes and is interpreted as a result of the interaction of the genes present rather than as a distinct phenomenon.

83. Whaley, W. G. 575.125:635.64:575.127.2
A developmental analysis of heterosis in *Lycopersicon*. I. The relation of growth rate to heterosis. II. The role of the apical meristem in heterosis.
Amer. J. Bot. 1939 : **26** : 609–16, 682–90.
The crosses studied were *L. esculentum* x *L. pimpinellifolium* and *L. esculentum* x *L. racemigerum*. Heterosis was in each case manifested as an increase in total plant size; the number and not the size of individual organs was increased.
In both crosses the hybrid grew faster than either parent in the early seedling stages and in the fruiting stages; but the differences were much less during the grand period of growth. In the second cross the hybrid embryo was intermediate between the two parents in size.
In the second paper it is shown that there was no relation, either in the embryo or during development, between the volume of the apical meristem and heterosis. Size of meristem was related only to the size of the determinate organs developed from it.
Cell and nuclear size were found to decrease during development, but much less rapidly in the hybrids than in the pure lines.

84. Tchernaev, I. 575.127:581.165.71
(Vegetative *rapprochement*).
Sovetskaja Botanika (Soviet Botany) 1939 : No. 2 : 66–69.
The method consists in grafting a young hybrid on to a mature plant of another species or genus with which it is desired to cross it or, alternatively, of grafting a mature shoot of the species in question on to the young hybrid, from which aerial shoots are later allowed to develop. A modification of the method is suggested, consisting in grafting a small cylinder of bark of the hybrid on to the stem of the mature species from which a similar piece has been removed; after 1 to 2 years the buds on the grafted portion are induced to form shoots, which, it is claimed, will cross more easily with the species in question than if they had not been treated.

85. HAGEDOORN. 575.24
Over de oorzaken van mutatie. Autoreferaat genetikadag 3 Juni 1939. (**On the causes of mutation. Report of the genetics conference on 3rd June 1939**).
Erfelijkheid in Praktijk, Leiden 1939 : **4** : 170–71.
A report of a lecture in which types of mutation and their possible causes are discussed. Most of the illustrations cited relate to animals. The author tends to reject, till proved, the possibility of positive mutation, i.e. the origin of a new gene or the chemical change of one gene into another. The origin of a new dominant character must not be confounded with the origin of a new gene.

CYTOLOGY 576.3

86. KIHARA, H. 576.312
(Cytogenetics. Species from a cytogenetical point of view).
Bot. and Zool. 1935 : **3** : 857–61.
This article concludes a series of papers (which started in Vol. I in 1933) containing a survey of cytogenetics in which the work of the author and many other investigators is reviewed. The subject matter is grouped under the following headings: The law of inheritance and the chromosome; chromosome maps; life of the chromosome; chromosome numbers; maturation division of polyploid plants; chromosome behaviour in hybrids; sterility of hybrids and chromosomes; genom analysis; the heteroploid and its inheritance; the chromosome ring and its gentical significance; haploid plants.

87. MCCALLUM, G. A. 576.312.34:576.354.4:633.526.2
The four strand structure of meiotic chromosomes of *Aloe* and *Lilium*.
Amer. J. Bot. 1939 : **26** : p. 672. (Abst.).
The four-strand structure in *Aloe striata* is visible at diakinesis, late anaphase and early telophase, but obscured at metaphase. *Lilium parvum* chromosomes show four strands at diakinesis.

88. 576.312.36:576.353:537.531:635.651
MARSHAK, A. 576.312.36:576.353:539.185.9:635.651
The nature of chromosome division and the duration of the nuclear cycle.
Proc. Nat. Acad. Sci. Wash. 1939 : **25** : 502–10.
Chromosome fragments involving one of the two chromonemata in mitotic anaphase chromosomes were found in *Vicia Faba* after treatment with X-rays or neutrons. There was a sharp maximum in the frequency of such fragments in material fixed 18 hours after irradiation. This is held to correspond to the critical stage at which the chromosome "split" occurs. Evidence is presented which indicates that the new pair of chromonemata formed in the resting stage is separated from the old pair in the succeeding anaphase.

89. SCHRADER, F. 576.312.381:576.312.341:576.354.4:633.15
The structure of the kinetochore at meiosis.
Chromosoma 1939 : **1** : 230–37.
It is suggested that apparent differences between the centromeres of Amphibia and such plants as *Zea* and *Tradescantia* are not fundamental, but are due to differences in resistance to movement of the chromosomes at anaphase. The "spindle spherule" of the centromere is shown to be fully divided at late prophase of the first meiotic division but the two halves are still held together in some way. The centromere is regarded as a compound structure that seems to be to some extent reorganized at each cell division.

90. MARSHAK, A. 576.353:539.185.9
Effects of fast neutrons on chromosomes in mitosis.
Proc. Soc. Exp. Biol. 1939 : **41** : 176–80.
Seedlings of *Vicia Faba*, *Pisum sativum* and *Lycopersicon esculentum*, and also mouse tumours,

were bombarded by fast neutrons. With the exception of six instances (out of 5,000) in which a section of a chromosome was markedly spread out and disorganized, the abnormalities observed at anaphase were all similar to those produced by X-rays. The maximum number of abnormal anaphases was observed when the material was fixed 3 to 9 hours after treatment. An exponential relationship was observed in each case between the minimum percentage of normal anaphases and the neutron dosage.
Ionization produced by neutrons appears to be about 2·5 times as efficient as that produced by X-rays. This point is to be investigated further.

91. Stebbins, G. L. (Jr.) 576.353:581.02:633.16
The effect of anaerobic conditions on mitosis in seedlings of *Hordeum*.
Amer. J. Bot. 1939 : **26** : p. 674. (Abst.).
Mitosis ceased at first but was continued after 3 or 4 days. The resting nuclei were smaller, staining was more intense, the chromosomes were much more contracted and tended to be clumped and they were often scattered through the cell at anaphase. Under prolonged anaerobic conditions the nuclear membrane broke down and nuclear material was extruded into the cytoplasm.

92. Marshak, A. 576.354.4:576.353:537.531:635.651
A comparison of the sensitivity of mitotic and meiotic chromosomes of *Vicia faba* and its bearing on theories of crossing-over.
Proc. Nat. Acad. Sci. Wash. 1939 : **25** : 510–16.
Pollen mother cells of *V. Faba* appear to be most sensitive to irradiation throughout zygotene and pachytene, a period of about 18 hours. The slopes of the sensitivity curves of chromosomes in meiotic prophase and at the onset of somatic prophase are closely similar, suggesting that the chromosomes are in a comparable condition. The author considers this as evidence conflicting with Darlington's precocity theory of meiotic chromosome behaviour.

93. Sansome, E. R. 576.354.46:576.356.2:635.656:575.127.2
Pairing behaviour and chiasma formation in plants with a structurally heterozygous pair in *Pisum*.
Genetica 1939 : **21** : 420–33.
In three plants derived from a *P. sativum* x *P. humile* cross which had a chromosome with duplicated end segments (YBCY), 20–30 per cent of nuclei showed two univalents at meiosis. It is shown that these were due to failure of pairing between the YBCY chromosome and its normal (YCD) homologue. There is no negative correlation between the chiasma frequencies of the heterozygous pair and those of the rest of the bivalents. It is deduced from the data that prophase pairing begins at the ends of chromosomes.
The difficulties involved in using the analysis of variance method for detecting negative correlations in chiasma frequencies between bivalents are pointed out.

94. Sax, K. and
Enzmann, E. V. 576.356:537.531:581.036
The effect of temperature on X-ray induced chromosome aberrations.
Proc. Nat. Acad. Sci. Wash, 1939 : **25** : 397–405.
Tradescantia microspores irradiated at low temperatures when in the resting stage or at mid-prophase show more chromosome aberrations than those irradiated at high temperatures. It is considered that the amount of chromosome breakage conditioned by X-rays is independent of the temperature but that at high temperatures fusion of broken ends is accelerated and more of the breaks re-unite in the original position than is the case at low temperatures.
When the microspores are irradiated at early prophase the above temperature effect is reversed, a fact which is difficult to explain.
The exact temperature at which the above effects are maximal varies considerably, apparently with the seasonal effect on the nuclear cycle.
The varied response of different types of tissues to temperature effects during irradiation can be attributed to the relative effects of physiological and genetic factors.

95. 576.356.5:633.52:581.04
MÜNTZING, A. and 576.356.5:633.491:581.04
RUNQUIST, E. 633.52:576.312.35
Note on some colchicine-induced polyploids.
Hereditas, Lund 1939 : **25** : 491–95.

Chromosome doubling was induced in *Linum usitatissimum*, in a seedling of the potato variety Triumph and in *Galeopsis pubescens*. Both the diploid and the tetraploid flax plants seemed to show some variation in chromosome number, that for the diploids being $2n = 31$–32 and for the tetraploids $2n = 58$–61. In some of the progeny of tetraploid plants the chromosome number was 61–62.

In the case of the potato, two plants had the doubled chromosome number, $2n = 96$ and one had $2n = 64$, or 16 chromosomes more than the parent form.

96. TAKENAKA, Y. 577.8:635.45
(Sex characters and descent of angiospermae).
Jap. J. Genet. 1939 : **15** : p. 45.

Studies on autosomes in *Rumex acetosa* L. have led to the conclusion that sex chromosomes and autosomes are not fundamentally distinguishable, they can be converted one into the other both naturally and artificially. Hence in some angiosperms male or female plants may sometimes appear unexpectedly. This phenomenon is said to occur particularly in sorrel, but also in other plants, such as maize.

AGRICULTURE 63

97. WELLENSIEK, S. J. 63.0015
Indrukken van een verlofsreis om de wereld. (**Impressions of a vacation trip round the world**).
Natuurk. Tijdschr. Ned.-Ind. 1938 : **98** : 128–39.

An interesting summary of the route taken by the author with brief comments on the research institutes visited is followed by sections dealing with growth substances in plants, the salivary chromosomes of *Drosophila*, Fisher's statistical methods for field experimentation (cf. "Plant Breeding Abstracts", Vol V, Abst. 268) and the author's views on the origin of the larger leaved tea plant (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 917).

PLANT DISEASES 632

98. 632.4:575.11
DODGE, B. O. 632.422.3:575.11:575
Some problems in the genetics of the fungi.
Science 1939 : **90** : 379–85.

A general review of work on the genetics of fungi, in the course of which reference is made to genetical and breeding work on yeasts and other economic fungi.

99. ROEMER, T. 632.45:575.42:633.11
Zehnjährige Versuche über Selektionswirkung in der Symbiose von Pilz und Kulturpflanze. (**Ten years' experiments on the effect of selection in symbiosis between fungus and cultivated plant**).
Kühn-Arch. 1939 : **48** : 169–78.

Experiments are described which demonstrate the selective action of the host plant on mixed populations of *Puccinia triticina* and *Tilletia tritici*.

CEREALS 633.1

100. 633.1:575.243:537.531
KAGAWA, F. 635.646:575.243.061.634:537.531
Alteration of characters in crop plants induced by X-ray irradiation.
Jap. J. Bot. 1939 : **10** : 35–41.

Chlorophyll-deficient types occurring among plants of *Secale cereale* and *Solanum Melongena* grown from X-rayed seed are reported. No seed was produced by these plants, so that the mode of inheritance of the chlorophyll deficiency is unknown.

Some of the plants grown from X-rayed seed of rice were partially sterile but none was chlorophyll-deficient. One of the partially sterile plants gave 3·7 per cent. of chlorophyll-deficients in its progeny and of six normal sister plants derived from this progeny, three gave rise to further chlorophyll-deficients (0·9–9·1 per cent). The deficient plants were of two distinct types.

Two dwarf plants were found in progeny of rye plants the ears of which were X-rayed at the meiotic stage. These showed 7 bivalents and no marked meiotic irregularity. One of them had branched ears.

101. Dorsey, E. 633.1:576.356.5:581.04

Chromosome doubling in the cereals.

J. Hered. 1939 : **30** : 393–95.

Chromosome doubling was induced by colchicine treatment in *Triticum monococcum*, *Avena brevis*, *Hordeum distichon* and *H. vulgare*.

WHEAT 633.11

102. Taylor, J. W., Bayles, B. B. and Fifield, C. C. 633.11:575.061.5:581.48:578.08

A simple measure of kernel hardness in wheat.

J. Amer. Soc. Agron. 1939 : **31** : 775–84.

A simple and rapid method of measuring the hardness of a sample of wheat grain is described. This consists of "pearling" the wheat for three minutes on an enclosed, electrically driven grindstone and determining the percentage by weight of the tissues removed.

Correlation studies were made in which the values obtained by this and earlier methods of determining grain hardness were compared.

103. 633.11:575.11–181.12:581.46

Mudra, A. 633.11:575.11 –181.12:581.44:519.241.1

Contribuţiuni la genetica grâului. III. Forma spicului şi lungimea paiului. (**Contribution to the genetics of wheat. III. Ear shape and straw length**).

Bul. Fac. Agron. Cluj (1938) 1939 : **7** : 176–92.

On the basis of studies of the F_2 and F_3 of various crosses it was established that the squarehead type is determined mainly by a single gene pair (*DD*), the heterozygote being intermediate. There are in addition various modifying factors that influence the degree of squareheadedness. The ear density factor pairs L_1L_1 and L_2L_2 each increase the average rachis internode length by about 1 mm. The squarehead gene pair *DD* decreases the average internode length by about 0·5 mm. In addition to these genes there are others that influence ear density to a lesser degree.

Length of straw proved to be dependent on polymeric factors. In some combinations the progeny was intermediate in straw length, in others the longer strawed type was dominant and in still others heterosis was manifested.

The correlation between straw length and ear density was not universal; it appeared to be an inherited character dependent upon specific genes.

104. Matsumura, S. 633.11:575.127.2:576.356

Weitere Untersuchungen über die pentaploiden *Triticum*-Bastarde IX. Aequations- und Zertationskreuzungen des Bastards *T. durum* x *T. vulgare*. (**Further investigations on pentaploid *Triticum* hybrids IX. The hybrid *T. durum* x *T. vulgare* used as the male and female back-cross parent**).

Jap. J. Bot. 1939 : **9** : 353–71.

The cross (*T. vulgare* x *T. durum*) F_1 x *T. durum* showed a much lower set of grain than the F_1 x *T. vulgare*, but the grain was plump and showed a higher germination. The rate of germination in the *T. durum* cross varied inversely with the chromosome number of the fertilized egg cell, which ranged from 14 to 20. In the *T. vulgare* cross the set was higher

but the grains were much wrinkled and germinated poorly. The wrinkling was most pronounced in grains from egg cells having the lower chromosome numbers (14–17) and such grains germinated more slowly. It was assumed that the many wrinkled grains that failed to germinate were also of low chromosome number.
The number of chromosomes derived from the egg cells in plants of the cross F_1 x *T. vulgare* was 14–17 in 39 plants and 18 20 in 17 plants, a ratio of 2·3 : 1. In the F_1 x *T. durum* cross the corresponding numbers were 62 and 10, and the ratio 6·2 : 1. Since, however, it was assumed that all the grains of the *T. vulgare* cross that failed to germinate were in the 14–17 chromosome group, the ratio in that cross was really about 5 : 1, a figure not differing greatly from the 6·2 : 1 for *T. durum*. Selective fertilization of egg cells with low chromosome number in the *T. durum* cross and egg cells with high chromosome number in the *T. vulgare* cross did not therefore occur to any appreciable extent.
The frequency distribution of effective egg cells with 14, 15, 16 . . . 20 chromosomes in the above crosses was such as would be expected if 35 per cent of the univalents were lost through lagging. It was similar to the distribution observed cytologically in the pollen mother cells.
When the F_1 was used as the male parent in crosses with *T. durum* and *T. vulgare*, the cross with *T. durum* showed wrinkled grains and poor germination and the cross with *T. vulgare* plump grains and relatively good germination. Pollen grains with 14 and 21 chromosomes were most effective in fertilization, relatively few grains with 16–18 chromosomes being successful. In the cross with *T. durum* as female relatively more 14-chromosome pollen grains effected fertilization than in that with *T. vulgare* as female, and the difference was again held to be due not to selective fertilization but to the fact that grains with 21 chromosomes from *T. vulgare* and 14 from the F_1 were shrivelled and often failed to germinate.
In the cross F_1 x *T. durum* one plant had 46 chromosomes, and in the cross F_1 x *T. vulgare* there was one 57-chromosome plant. These were considered to be due to fertilization of unreduced egg cells.

105. Kagawa, F. 633.11:575.127.5:633.14:576.354.4:581.036
The effect of abnormal temperature on the course of pollen formation in a genus hybrid *Triticum compactum* x *Secale cereale*.
Jap. J. Bot. 1939 : **10** : 55–68.
Meiosis and pollen formation of F_1 hybrids of *T. compactum* x *S. cereale* subjected to alternate cold and heat treatment were studied in comparison with control material. Exposure to extreme temperatures was found to lead to the following meiotic irregularities (1) asynapsis and consequent non-reduction, (2) the formation of restitution nuclei and (3) the formation of a single large nucleus in one of the two cells formed by the first division, the other cell having no chromatic content at all.
Dyad cells comprised 3·5 and 8·6 per cent of the total number of pollen grains in two treated plants and varied from 0·3–1·6 per cent in four controls.
The percentage of good pollen in F_1 plants grown in the field was about 1·5. This pollen was large and its amount corresponds closely with the percentage of unreduced pollen grains observed in the above control plants.

106. Poddubnaja-Arnoldi, V. 633.11:575.127.5:633.289:581.3:581.162.5
On hybridization between *Triticum* and *Elymus*.
C. R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 378–81.
Although fertilization apparently occurred, there was no embryo or endosperm formation in a number of *Triticum* x *Elymus* crosses. In the cases of *T. Timopheevi* x *E. araliensis* and *T. vulgare* x *E. dahuricus* embryos and endosperms occasionally passed through the early stages of development, but soon aborted.

107. 633.11:575.129:633.14
Müntzing, A. 633.11:575.127.5:633.14:576.354.4:581.162.5
Studies on the properties and the ways of production of rye-wheat amphidiploids.
Hereditas, Lund 1939 : **25** : 387–430.
Six constant strains of *Triticale* were studied. They showed characteristic differences in

vigour, fertility, the amount of meiotic irregularity, baking quality, frost hardiness and other characters. They showed no loss of vigour or fertility on selfing, in that way resembling the wheat parent.
Crosses between the above *Triticale* strains were difficult to effect, the average seed set being only 5·08 per cent. The hybrids showed an increase in vigour but lower fertility than the parents, with a greater degree of meiotic non-conjunction. The F_2 progeny showed reduced vigour and fertility as compared with the F_1.
New strains of *Triticale* were obtained by crossing *Triticale* with primary rye x wheat hybrids and by crossing *Triticale* with wheat. The use of different wheat varieties was found to lead to the production of different proportions of unreduced gametes. Fifty-six chromosome forms were obtained in large numbers from the *Triticale* x F_1 (rye x wheat) crosses, but only in one instance from the *Triticale* x wheat crosses, which in general showed a decrease in chromosome number in subsequent generations from about 49 in the F_1.
Octoploid derivatives of the above crosses were more vigorous and fertile than plants with chromosome numbers intermediate between octoploid and hexaploid.
Present *Triticale* strains give only 60–65 per cent of the yield of the best wheat varieties. This may be due in part to the fact that open-pollinated rye plants have been used in their production, with consequent loss in vigour on inbreeding. It is suggested that selected inbred rye lines should henceforth be used.
The breeding of improved *Triticale* varieties is rendered easier by the fact that the characters high fertility, good quality grain and vigorous tillering are all positively correlated.

108. KATTERMANN, G. 633.11:575.129:633.14:575.114
Über heterogenomatische amphidiploide Weizenroggenbastarde. (**Amphidiploid wheat-rye hybrids with different genoms**).
Z. Pflanzenz. 1939 : **23** : 179–209.

Secale cereale was pollinated with a number of different species of *Triticum* and the F_1 plants obtained were pollinated with wheat-rye amphidiploids of various origins, the object being to produce from the amphidiploids hybrids combining different genoms so as to increase their capacity for variation.
The resulting plants were seen to vary in such characters as leaf width, colour of coleoptile and first leaf, rust and frit fly infection, dehiscence of the anthers, fertility, quality of the grain and total yield. Variation occurred also in the number of spikelets per ear, which, however, remained higher than in the wheat parent, in the rachis length, the toughness of the rachis, the thickness of the stem and in its degree of hairiness. Various somatic mutations were also observed.
The variations referred to are mostly thought to be caused by variations in the chromosome complement; how far they will lead to the results desired in practical breeding will be shown by further study.

109. GUERZI, E. 633.11:576.312.34
I cromosomi somatici di cinque razze di frumento. (**The somatic chromosomes of five races of wheat**).
Ital. Agric. 1939 : **76** : 639–57.

The existing knowledge on the karyology of wheat species is reviewed. Root tip observations were made on five varieties of *Triticum vulgare*, the form and size of the chromosomes being reported, together with data on the cells of the different tissues of the root. Slight differences were observed between the varieties in respect of size of cells and chromosomes.

110. BUSTANET, J. and CHEVALIER, R. 633.11–2.111–1.521.6:575(44)
Les enseignements de l'hiver 1938–39 et la sélection des blés. (**The lessons of the winter of 1938-39 and the selection of wheat**).
Sélectionneur 1938 : **7** : 151–61.

The effects of the hard winter of 1938–39 on the wheat crops in France are described in detail and French wheat varieties are classified according to their cold resistance. It is shown that there is a great need for more cold-resistant varieties. Something may be done

in this respect by selecting land varieties, but it is considered that this will not lead to high-yielding new types. The alternative is to make crosses with foreign wheats more resistant than even the most cold-resistant French ones, particularly with American types such as Minhardi, Oro and White Odessa. The difficulty in breeding for cold resistance is that sufficiently hard winters to permit selection work occur but rarely. It may be possible at some stations to make special plantings in exposed situations.
Another line of advance would be the breeding of alternative wheats, i.e. those that may be sown as winter or spring wheats and could therefore be re-sown if a winter sowing were killed by frost. French varieties which have this characteristic are listed and classified.

111. Ivanov, P. K. 633.11–2.112–1.521.6:581.43
(The root system and drought resistance of different varieties of wheat).
Sotsialističeskoe Zernovoe Khozjaistvo (Socialistic Grain Farming) Saratov (1938) : 1939 : No. 6 : 129–41.
Drought-resistant varieties such as Erythrospermum 841 and Graecum 289 are slow in root development in the early growth phases and rapid in later phases. The correlation between root length and drought resistance is not a direct linear relationship but something much more complex. A study of these complexities is necessary for breeding resistant varieties.

112. Kale, G. T. 633.11–2.452–1.521.6:575
Breeding rust resistant wheat.
Int. Rev. Agric. 1939 : **30** : T325–30.
In continuation of the article referred to in "Plant Breeding Abstracts", Vol. IX, Abst. **708**, work on breeding for rust resistance in Germany, Denmark, Greece, Italy, Portugal, Turkey, Wales and Yugoslavia is described.
It is pointed out that the work of breeding rust-resistant wheats is a continuous one, since outbreaks of new virulent strains of the pathogen are always liable to occur. The problem is however simplified by the fact that some wheats, e.g. H–44–24 and Hope, contain single genes for resistance to a number of strains of a rust, or even to all the strains now known.

113. 633.11–2.452–1.521.6:575(78.4)
Smith, G. S. 633.11–2.183–1.521.6:575(78.4)
Durum wheat breeding.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1939 : **1** : No. 4 : 10–12.
The best *T. durum* varieties grown in North Dakota, Mindum and Kubanka, suffer from weakness of straw and insufficient rust resistance. The first problem has been tackled by crossing Mindum with Pentad and back-crossing the best selections to Mindum. For rust resistance a similar technique has been employed, using Vernal Emmer as the resistant parent. No new variety is yet ready for distribution but in both problems considerable progress has been made. Further back-crosses to Mindum are being effected.

114. Stoa, T. E. and
Harris, R. H. 633.11–2.452–1.521.6:575(78.4)
Which rust resistant wheats are most desirable?
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1939 : **1** : No. 3 : 31–35.
Certain of the newer American and Canadian rust-resistant wheats are described and compared with Thatcher. It is concluded that, though some of them exceed Thatcher in rust resistance or yield, none gives as good a combination of disease resistance, yield and quality.

115. Waldron, L. R. and
Harris, R. H. 633.11–2.452–1.521.6:575(78·4)
New varieties of rust resistant wheat.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1939 : **1** : No. 3 : 35–37; also Northw. Miller 1939 : **198** : No. 7 : p. 4.
Four new varieties are described; Rival, Vesta and Mercury, developed in North Dakota from a cross of Ceres x (Hope x Florence), and Pilot, bred by J. A. Clark from a Hope x Ceres cross.

Rival and Pilot are to be released to North Dakota farmers in 1939, while the others are to be tested further. Rival is slightly more susceptible to stem rust and less susceptible to leaf rust than Thatcher, has equal milling and baking quality and has given higher yields. Pilot has similar characteristics, but is apparently a little inferior in strength of straw.

116. Straib, W. 633.11–2.452–1.521.6:575.127.2
Die Faktorenbeziehungen im Verhalten des Weizens gegen verschiedene Gelbrostrassen. [**The factor relationships in the behaviour of wheat towards different races of yellow rust (*Puccinia glumarum*)**].
Z. indukt. Abstamm.- u. VererbLehre 1939 : **77** : 18–62.

The seedling reaction of various wheat crosses to several physiological races of yellow rust was studied under controlled greenhouse conditions. A form of *Triticum Spelta* var. *album* which was resistant to all the races of rust used was crossed with five varieties of *T. vulgare*, and in addition crosses between *T. vulgare* varieties were studied. It was found that the seedling resistance of *T. Spelta* behaved as a monogenic dominant to susceptibility in *T. vulgare*, and as a simple recessive to immunity. In some *T. vulgare* x *T. vulgare* crosses a similar relationship held and the results of diallel crossing involving *T. Spelta* var. *album* and the *T. vulgare* varieties Strube's Dickkopf and Spalding's Prolific suggested that the factors for immunity, resistance and susceptibility were multiple allelomorphs. These allelomorphs determined the reaction to several physiological races of the fungus. In other crosses between *T. vulgare* varieties the mode of inheritance was more complex; resistance was recessive and several factors were involved.

In addition, five *T. vulgare* crosses were studied with respect to their mature plant resistance in the open. The results were complicated and no definite factorial scheme could be put forward except in two cases, where there was a 3 : 1 ratio for susceptibility v. resistance in the F_2. Susceptibility was generally dominant in these crosses.

It is probable that resistance in the seedling stage is correlated with mature plant resistance. There is no correlation between the genes for resistance to yellow rust and the *T. Spelta* ear type.

117. McFadden, E. S. 633.11–2.452–1.521.6:578.08
Brown necrosis, a discoloration associated with rust infection in certain rust-resistant wheats.
J. Agric. Res. 1939 : **58** : 805–19.

Two distinct types of resistance of mature plants to stem rust, designated as "photologic" and "morphologic" were found in segregates of an H–44 x Marquis cross. The former type was only expressed under a high light intensity and wheats carrying it (e.g. Hope, H–44) showed dark brown necrotic areas around points of infection. This may give an appearance called "brown necrosis", which has often been confused with bacterial black chaff disease.

It appears that the brown necrosis reaction may be used for identifying rust-resistant seedlings at an early stage of development. This would simplify breeding for rust resistance by the back-cross method.

118. Jasnowski, S. 633.11–2.7–1.521.6:575.11
Badania nad dziedziczeniem odporności pszenic jarych *Tr. vulgare* L. na niezmiarkę *Chlorops pumilionis* Bjerk. (**On the inheritance of resistance of wheat to *C. pumilionis* Bjerk.**).
Arch. Nauk. Biol. 1938 : **8** : Fasc. 3 : Pp. 60.

Studies were made on a number of lines, some of which were characterized by a high proportion of attacked plants, others by a low proportion, the lines being in other respects genetically identical and homozygous. In spite of this the lines differed among themselves in the percentage of plants attacked and in the intensity of attack, the differences being ascribed to the influence of environmental factors. The percentage of attacked plants was found to be a better criterion of the resistance of a variety than the degree of attack, which differed from year to year.

The inheritance of resistance was studied in two crosses of spring wheat, *Triticum vulgare*, Chińska (Chinese) x Ostka Hildebrandt'a (Hildebrandt's awned) and Chińska x Suska. The variety Ostka Hildebrandt'a was characterized by a relatively low percentage of attacked stems, varying in the years 1932–34 between 0·2 and 12·6 per cent, compared with variations of 38·3 to 78·9 per cent for Chińska and 18·7 to 62·5 for Suska. The variation from year to year was also much lower in Ostka than in the other varieties.

In the F_3 to F_6 generations there appeared various resistant lines, with percentage attack varying from 0·1 to 20·0, i.e. about the same as the resistant parent. These lines proved to be homozygous for resistance. Other lines homozygous for susceptibility occurred, their percentage attack varying from 72·6 to 100. There were other homozygous lines still that showed an intermediate degree of attack varying in 1931–34 from 32·6 to 52·5 and in 1935 from 40·1 to 60·0 per cent. The existence of this group suggests that resistance is dependent on two pairs of cumulative genes.

In addition to these homozygous families there occurred a number of segregating families, in which the percentage attack changed in successive years, falling in some, rising in others. In addition to the two gene pairs *AA* and *BB* governing resistance, the author postulates a gene pair *Ss*, which determines the degree of resistance, high resistance being recessive; *S* also increases the variability in percentage attack, so that high variability can arise either from heterozygosity, the presence of *S* or both. Formulae for the genetical constitution of the different lines are suggested. A space of three or even four years is required to decide whether a line belongs to the constant (*ss*) or variable (*SS* or *Ss*) type; if a family remains constant for four years it can then be taken with certainty to be homozygous *ss*.

Correlations were studied in the cross Ostka Hildebrandt'a x Chińska. No correlation was observed between resistance and weight of grain per plant, number and weight of grains per ear, vitreousness of grain, awning or strength of straw. A positive correlation was observed between percentage of stems attacked and number of mature ears per plant, r being equal to $+ 0{\cdot}47 \pm 0{\cdot}05$, showing that the earlier formed stems are the more resistant. Early varieties of spring wheat proved to be more resistant than late varieties, the correlation between time of ripening and resistance being $r - 0{\cdot}52 \pm 0{\cdot}03$. Late sowing also increased the degree of attack in susceptible varieties but resistant forms were very little affected.

A study of various morphological characters of the stem showed the sclerenchyma layer to be narrower in resistant than in susceptible varieties; increase in thickness of the sclerenchyma layer ceases earlier in the resistant than in the susceptible lines. The number of islands of green parenchyma in the stem was less in resistant lines (38) than in susceptible (40) and the islands were not so deep in the resistant lines. The number of vascular bundles in the stem was also smaller in resistant forms (52) than in susceptible (62). Other characters, such as the thickness of the stem wall, the width of the parenchyma islands, the thickness of the pith and the size of the vascular bundles were not correlated with resistance, except that the diameter of the smaller bundles was greater in resistant forms in the early stages of growth, the difference disappearing in later stages.

An examination of the different genotypes showed that the characters indicated as being correlated with resistance were all linked with one another and with resistance. The gene *S* has the effect of materially increasing the thickness of wall in the cells of the sclerenchyma layer, which is considered therefore to be a valuable character in selecting for resistance.

119. Przyborowski, J. and Nawrocki, Z. 633.11.00.14(43.8)

Doświadczenia z odmianami pszenicy jarej przeprowadzone w Polsce w latach 1936–1938. (**Experiments with spring sown varieties of wheat carried out in Poland during 1936-1938).**

Prace Nauk. Rol. (Pap. Agric. Res.) Supplement to Przegl. Doświad. Roln. (Rev. Agric. Res.) 1939 : No. 8 : Pp. 32.

The experiments show the existence of a high variety-season interaction from which it is concluded that data covering a relatively large number of years are required before conclusions can be drawn regarding varietal differences. There was also a variety-locality interaction but this was not so high as to obscure the varietal differences. Certain varieties gave yields consistently lower than the standard; these were Jedyna Suska, Heines Kolben, Ordenatka,

Hildebrand's S.30, Ostka Puławska and Ostka Suska. The new variety Ostka Pokucka gave the highest yields of all, followed by Ostka Chłopicka and in certain zones Puławska Twarda (*Triticum durum*).

120. 633.11.0014(48.1)
VIK, K. 633.14.0014(48.1)
Sortsforsøk, såtidsforsøk og forgrødeforsøk med høsthvete og høstrug. (**Variety trials, sowing time trials and comparison of different places in crop rotation for winter wheat and winter rye**).
48. Årsmeld. Norges LandbrHøisk. Åkervekstforsøk 1939 : 17–86.
Field trials of Swedish and Norwegian winter wheats totalling 118 have been held in south-eastern Norway from 1927–37.
Enger, a very winter-hardy but weak-strawed Norwegian land variety, has given the highest average yield under rather severe conditions of climate and soil. The grain is not large but has the highest hectolitre weight and is of good baking quality.
The second best in yield of grain was the new line 012 from a cross between a Norwegian land form (Th 0102) and the Svalöf Sol wheat. Its straw is stronger than that of Enger.
Winter ryes of Swedish, Norwegian and German origin were tested in 49 trials from 1928–37. A new selection No. 0114 from an old Norwegian variety gave higher yields than unselected land varieties.
The highest average yield was obtained with the Svalöf varieties Vasa II and Mahm.

BUCKWHEAT 633.12

121. SANDO, W. J. 633.12:576.356.5:581.04
A colchicine-induced tetraploid in buckwheat.
J. Hered. 1939 : **30** : 271–72.
Tetraploid ($2n = 32$) plants of Tartary buckwheat (*Fagopyrum tataricum*) were obtained by treatment of the stems of seedlings with colchicine. They were taller than the normal diploids and showed increases in the size of various plant parts varying from 15 to 63 per cent.

OATS 633.13

122. MORDVINKINA, A. I. 633.13:581.9
(**Eco-geographical classification of cultivated and weed oats**).
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1939 : No. 9 : 3–10.
Studies of the world collection of oats in regard to agronomic and industrial characters such as earliness, drought resistance, immunity to fungous disease and standing capacity have made it possible to establish 29 geographical groups. The characteristics of these groups are briefly outlined, with indications of the value of some of them from a breeding point of view.

123. STEFANOWSKI, J. A. and
VECHESLOVA, E. M. 633.13–2.112–1.521.6
(**Drought resistance of different agro-ecological groups of oats**).
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1939 : No. 11 : 3–8.
Observations were made on 362 varieties of oats comprising most of the main species and ecological groups. They are grouped according to their drought resistance and the characteristics of each group are briefly indicated. The greatest resistance was found amongst *Avena byzantina*. In *A. sativa* the most resistant forms were those from the steppes, central Spain and Mongolia.

124. 633.13–2.112–1.521.6:578.08
COFFMAN, F. A. 633.13–2.112–2.111:519.241.1
Heat resistance in oat varieties.
J. Amer. Soc. Agron. 1939 : **31** : 811–17.
A satisfactory test of heat resistance was found to be to subject oat seedlings to a temperature of 48½°–52° C for 45 minutes.

Heat resistance seemed to be closely related to winter-hardiness and it is suggested that both may have the same physiological basis. It is possible that heat resistance trials (which are easy to carry out) may prove to be a convenient and reliable index of winter-hardiness. Oat varieties showed considerable differences in heat resistance and it seems likely that spring oats much more heat resistant than the important present-day varieties could be bred.

RYE 633.14

125. LANDES, M. 633.14:581.162.5:581.3
The causes of self-sterility in rye.
Amer. J. Bot. 1939 : **26** : 567–71.

Although failure of pollen tube growth plays some part, a cause of much of the self-sterility in rye is the abortion of self-fertilized ovaries in the early stages.

MAIZE 633.15

126. MUDRA, A. 633.15:519.241.1:581.48
Insuşirea "forma bobului" in ameliorarea porumbului. (**The character "grain shape" in maize breeding**).
Bul. Fac. Agron. Cluj (1938) 1939 : **7** : 166–68.

On the basis of measurements of 300 cobs of the maize variety Siebenbürger-Varady, weak correlations were established between elongated grain shape and the two characters grain percentage ($r = +0{\cdot}28$) and embryo size ($r = -0{\cdot}29$). Grain shape was not correlated significantly with weight of grain per cob nor with the thickness of the rachis.
The grains of two cobs were measured and grown separately but no differences could be detected between plants from grains of different shapes either in vegetative characters or in yield.

127. ZAPPAROLI, T. V. 633.15:575(45)
Due altri granoturchi selezionati, Rostrato Cajo Duilio (S.M.), Giallo tondo S. Pancrazio B. (S.M.). [**Two further selected maize varieties, Rostrato Cajo Duilio (S.M.) and Giallo tondo S. Pancrazio B. (S.M.)**].
Ital. Agric. 1939 : **76** : 609–14.

The two hybrids are described. The former is promising on account of its early maturity, high yield and quality, the latter for its high yield, earliness and suitability for very dry soils.

128. BERKNER, F. W. 633.15:575:519.241.1
Beiträge zur Kenntnis der Maispflanze. (Anregungen für die Auslese bei der Maiszüchtung). (**Contributions towards the knowledge of the maize plant. Suggestions for selection in maize breeding**).
Z. Pflanzenz. 1939 : **23** : 210–38.

Maize forms with high tillering capacity, producing a number of stems per plant, are known but are late in maturity; by hybridization it should be possible to produce earlier forms. By selection among ordinary strains it is possible also to effect a considerable increase in the number of stems per plant. The Hindu Kush collection contained types that produced as many as 10 cobs per plant.
Plant height was positively correlated with length of vegetation period, though the correlation was broken in certain varieties. Number of leaves was also correlated with length of vegetation period; the varieties of the Hindu Kush were however all characterized by a higher number of leaves than the European varieties; moreover dent corns tend to have more leaves than flint varieties.
Unexpectedly marked varietal differences were observed in duration of flowering, which varied from 3 days in one variety to 16 in others. There were similar differences in the interval of time between the appearance of the tassels and silks; in breeding it is desirable to select types in which the flowering of male and female inflorescences is more or less simultaneous.
The height of the cob on the plant was greater in late varieties than in early, but in each maturity group variations between varieties occurred. The varieties of the Hindu

Kush collection tend to have their cobs placed higher than in other varieties. The selection of low cobs is recommended in breeding maize for unfavourable climatic conditions, whilst high cobs are to be preferred in areas where there is a danger of damage by pheasants. Early varieties tend to bear a larger number of cobs per plant though again there are varietal differences in each maturity group.

A positive correlation was observed between the number of foliage leaves and the number of husks and between thousand corn weight and percentage grain in the cob. No correlation was detected between time of maturity and length of cob or cob form, percentage of core, thousand corn weight and susceptibility to smut (*Ustilago zeae*). This susceptibility was greater in the Hindu Kush varieties than in high-bred varieties. In the high-bred varieties there was a tendency for later varieties to be more susceptible.

129. Mudra, A. 633.15:575:578.08:581.331.2
Experienţe cu privire la păstrarea polenului de porumb. (Experiments on pollen storage in maize).
Bul. Fac. Agron. Cluj (1938) 1939 : **7** : 172–75.

Various methods of storing pollen were tried and it was found that under favourable conditions, the grains may remain viable for 21 days. The best methods were to store the pollen in a refrigerator at 3–8° C or to keep cut tassels.

130. Fraser, A. C. 633.15:575.116.1
Some materials for genetic instruction.
J. Hered. 1939 : **30** : 375–78.

Stocks heterozygous for the second chromosome genes lg_1, gl_2, B and V_4 form very suitable material for demonstrating linkage in maize to students. Such stocks are being made available to teachers.

131. Middleton, G. K. and 633.15:575.12(75.6)
Harvey, P. H. 633.15.00.14(75.6)
Preliminary tests of corn hybrids in North Carolina, 1938.
Circ. N.C. Agric. Exp. Sta. 1938 : No. 114 : Pp. 4. (Mimeographed).

Variety trials of maize hybrids, chiefly from the Corn Belt, are reported. It is felt that hybrids adapted to local conditions must be bred in North Carolina before hybrid corn will become popular in the state and a corn breeding programme was therefore started in 1936. Some 700 inbred lines from southern varieties were on hand in 1938 and are to be selected further and also tested in hybrid combinations and in crosses with inbreds from the Corn Belt.

132. Wiidakas, W. 633.15:575.12(78.4)
Hybrid corn for North Dakota.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1939 : **1** : No. 4 : 3–6.

The general principles of hybrid maize production are expounded.

In North Dakota, inbred strains of Minnesota 13, Northwestern, Ivory King and Manitoba Flint have been developed and many others are under observation and test. A large number of hybrid combinations of these lines were under test in 1938.

One hybrid, Nodakhybrid 14, has so far been released by the experiment station. It is a double cross of lines developed from Dakota White. It equals the parent variety in yield and earliness but is more suited to mechanical harvesting.

Several dent double crosses were tested in 1937 and 1938 and the best show substantial gains in yield over the parental types. Some of these will be placed in more extensive trials in 1939.

133. Paddick, M. E. and
Sprague, H. B. 633.15:575.125:519.241.1:581.48
Maize seed characters in relation to hybrid vigor.
J. Amer. Soc. Agron. 1939 : **31** : 743–50.

Evidence is presented indicating that embryo size is not a significant factor in the induction of hybrid vigour in maize.

By mixed pollinations, selfed and hybrid grains were obtained on the same ear. The excess weight of hybrid over selfed grains in these conditions was not correlated significantly with the forage yield of the hybrid but there was a barely significant correlation (r = about 0·39) with its yield of grain.

134. Capinpin, J. M. and Nakornthap, A. 633.15:575.125:575.148
The value of first generation hybrid seed of some regional strains of Lagkitan corn.
Philipp. Agric. 1939 : **28** : 271–85.

Three inter-strain hybrids of the Lagkitan variety of maize exhibited increases of 1·1 to 13·9 cm. in plant height over the parent varieties and yields from 8·63 to 54·96 per cent higher than the average of both parents. In two out of three cases, in both dry and wet season plantings, the hybrids were more profitable to grow than the better parent strain after the cost of hybridization had been taken into account.

135. Hayes, H. K. and Johnson, I. J. 633.15:575.148:575.12:519.241.1 633.15:575.125
The breeding of improved selfed lines of corn.
J. Amer. Soc. Agron. 1939 : **31** : 710–24.

Distinctly improved inbred lines were obtained by pure line selection in crosses between maize inbreds, the main bases of selection being growth vigour, smut resistance and resistance to lodging.

The new inbreds were crossed with the variety Minnesota 13 to determine their combining ability. Good combining ability was most often obtained in crosses between inbreds that were themselves good combiners, indicating that combining ability is an inherited character. Extensive correlation studies involving characters of the inbred lines and of the inbred-variety crosses are reported. The following characters of the inbreds were found to be significantly correlated with yield of the corresponding hybrids: date of silking, plant height, ear height, leaf area, pulling resistance, root volume, stalk diameter, total number of brace roots, tassel index, pollen yield, yield index and ear length.

Inbreds of good combining ability were selected from inbred-variety crosses. F_1 combinations of these inbreds were made in three groups, between lines with no parents in common and with one and both parents in common respectively. Group I crosses were superior in yielding ability to group II and far superior to group III.

136. Beadle, G. W. 633.15:576.16 635.677
Teosinte and the origin of maize.
J. Hered. 1939 : **30** : 245–47.

When heated, teosinte (*Euchlaena mexicana*) grains pop in the same way as common pop-corn, and the author suggests that the species was cultivated by prehistoric American man for use in this way, and that maize was derived from it by a process of mutation and selection.

137. McClintock, B. 633.15:576.356.2:581.483:581.481
The behavior in successive nuclear divisions of a chromosome broken at meiosis.
Proc. Nat. Acad. Sci. Wash. 1939 : **25** : 405–16.

A further study of the phenomenon discussed in "Plant Breeding Abstracts", Vol. IX, Abst. 248. By the utilization in crosses of lines with a structurally changed chromosome 9 with known marker genes it was possible to demonstrate genetically and cytologically that in the endosperm the ends of sister half-chromatids fuse after breakage of the chromatid in an anaphase bridge, leading to the production of a new bridge in the next division, followed by another breakage and fusion. The whole cycle is repeated apparently indefinitely. Genetically the effect of this behaviour leads to the production of endosperm mosaics.

In the embryonic tissues the broken end becomes healed and remains permanently healed in subsequent divisions.

138. Jones, D. F. 633.15:577.81:575.113.5
Sex intergrades in dioecious maize.
Amer. J. Bot. 1939 : **26** : 412–15.
Three families of dioecious maize, formed from a known combination of mutant types, have been grown for nine generations. In all families there are variations in the sex balance, and sex intergrades which respond to selection are found. Sex expression appears to be genetically controlled in this material and is relatively uninfluenced by environmental changes.

BARLEY 633.16

139. Robertson, D. W. and Wiebe, G. A. 633.16:575.113:001.4 633.16:575.116.1
Genetic factors in barley.
Published privately. Pp. 25. (Mimeographed).
The known genes in barley are listed and given symbols which, it is suggested, should be adopted as standard. Data on linkage in barley are also tabulated.

140. Tometorp, G. 633.16:576.356.52:576.354.4
Cytological studies on haploid *Hordeum distichum*.
Hereditas, Lund 1939 : **25** : 241—54.
The haploid was reduced in size and usually showed 7 univalents at meiosis, though in 5.6 per cent of cells there was one bivalent. The course of microsporogenesis is described. Only 0·2 to 0·3 per cent of the pollen was normal.

141. Kattermann G. 633.16:581.162.5:576.356:575.11
Sterilitätsstudien bei *Hordeum distichum*. (**Sterility studies in *H. distichum*).**
Z. indukt. Abstamm.- u. VererbLehre 1939 : **77** : 63–103.
The cytological behaviour of five sterility groups of *H. distichon* is considered. The occurrence of trabants on four somatic chromosomes is shown. The visibility of the trabants depends on fixation, and it is considered probable that they exist in some cases –particularly on short chromosomes—where they are not apparent.
One sterility group is shown to be a trisomic, with $2n = 15$ chromosomes. At meiosis in this group, the occurrence of trivalents is common, and their form and segregations are given. The other groups, with $2n = 14$ chromosomes, show at meiosis negligible variation in chiasma frequency from the normal, and there is insufficient variation in the behaviour of the pollen mother cells to account for the sterility.
Embryological evidence indicated that the genetical cause of the sterility is a gene *s*. This gene is carried by the pollen and acts as a gametic lethal in causing degeneration of embryo-sacs through disturbing the antipodal cell development.
The embryological studies so far made are insufficient to account for sterility in the other groups, but they are being continued.
In crosses between the different groups, fertilization and development of embryo and endosperm are illustrated and tabulated. It is shown that in most cases the time between pollination and fertilization is three hours. J. C. C.

142. Stefanovsky, J. A. 633.16–2.112–1.521.6:575
(**The drought-resistance of barleys of different geographic origin**).
Vsesojuznaja Akademija Sel'skokhozjaistvennykh Nauk im. V.I. Lenina, Vsesojuznyi Institut Rastenievodstva (Lenin Academy of Agricultural Sciences, Institute of Plant Industry) Leningrad 1936 : Diss. No. 2 : Pp. 58.
Studies were made upon 170 samples of barley belonging to 32 different countries and representing different botanical varieties. The various possible methods of testing are described, with special reference to the fact that drought resistance is not an absolute character but very complex, it being possible for a plant to be resistant in one phase of development and susceptible in others. No indirect method of testing has been found thoroughly satisfactory. The barleys are classified into early, mid-early, mid-late and late earing. A rough classification

of the varieties into those with a long, medium and short thermo-stage corresponds fairly closely with their geographical distribution. The length of the individual developmental periods also varies from variety to variety.
As a result of these distributions the author distinguishes a number of geographical types: the northern type (Finland, Karelia, etc.) is early in maturity, the period from germination to ear emergence is 45 to 48 days, from earing to wax ripe 20 to 24 days; it does not react to vernalization and is very sensitive to drought or high temperature during the earing period. These are the most susceptible to drought. Other geographical types for which the characteristics are given, are the Scandinavian, the E. Siberian, the W. European, the E. Caucasian, the W. Caucasian, the highland Caucasian, the Armenian, the Asia Minor, the S. Russian, the Central Russian, the Central European, the Abyssinian, the Chinese, the Japanese, the Indian, the Central Asiatic, the Syria-Palestine, the Arabian and the Mediterranean types.
In breeding for drought resistance, different types are suitable for different areas. Thus for the Odessa region the early type with very rapid development is the only one that survives, in W. Siberia the varieties with slow development, especially at the time of tillering are the best, in view of the early incidence of the drought. In other words early varieties are found to be most resistant to late drought and late varieties to early drought, since the plant is most drought-resistant in the tillering period. Marquis, Milturum 0274 and Caesium 0111 are resistant to early droughts, Erythrospermum 0841 and Melanopus 069 to late droughts. It is thought that by crossing representatives of one group with the other, forms more resistant than either might be obtained. A list is given of the varieties thought to be most promising for use as parents.

MILLETS AND SORGHUM 633.17

143. Kendrick, J. B. and Briggs, F. N. 633.174–2.411.4–1.521.6:575.42(79.4)
***Pythium* root rot of milo and the development of resistant varieties.**
Bull. Calif. Agric. Exp. Sta. 1939 : No. 629 : Pp. 18.

The variety Double Dwarf Darlo, though highly resistant to *Pythium* root rot, ripens about two weeks later than Double Dwarf Yellow milo and is less resistant to excessive alkalies in the soil and to heat. Selections were accordingly made of surviving plants in diseased crops of Double Dwarf Yellow, Dwarf White and Heileman milos and highly resistant lines otherwise typical of the varieties have been obtained. The first of these, Double Dwarf Milo 38, has already been distributed.

RICE 633.18

144. Dubov, T. I. 633.18:575(47)
(**Method of breeding work in rice**).
Trudy Risovoi Opytnoi Stantsii NKZ, S.S.S.R. (Transactions of the Rice Experiment Station of the U.S.S.R. People's Commissariat of Agriculture) 1938 : No. 9 : 155–61.

The methods of carrying out selection, the characters selected for and the method of artificial hybridization are described. New lines are tested under a variety of cultural conditions. Valuable selections are reproduced vegetatively to increase the rate of multiplication.

145. Toxopeus, H. J. 633.18:575(59.7)
Aanteekeningen over de rijstcultuur in Fransch-Indochina. (**Notes on rice cultivation in French Indo-China**).
Landbouw 1939 : **15** : 291–303.

In the Mékong delta each province has its own experiment farm on which selection is carried out. The varieties of each ecologically uniform area are collected and purified and the best ultimately tried in block tests. Any high yielding forms are then examined for their economic characters, including those pertaining to the husk and its removal.
Selection is mainly concentrated on yield, combined where possible with the best export quality. Other problems which call for the breeder's attention are the production of varieties

resistant to injurious environments such as brackish water, the presence of alum in the soil and resistance to *Selerotium*. As well as the external characters of the grain, its cooking quality should also be considered in selection in view of the importance of this quality in the production, when necessary, of mixtures of two or more varieties of a suitable standard for export.
Seed is produced from only a few of the existing varieties but a live collection of all forms is being made in order that any of potential utility may not be lost and will be available, if necessary, for subsequent breeding operations.
In Tonkin selection work and the introduction of selected seed among the growers has been recently started but on a much smaller scale than in Saigon. It is too early yet to judge how far the system has been effective.

146. YAMAGUTI, Y. 633.18:575.1(52)
(The genetics of rice).
Jap. J. Genet. 1939 : **15** : 1–9.
A survey of the achievements in rice breeding in Japan by Kato and Hoshino in the early years of research and by other workers in various countries in recent times. A comparison is made between the lines along which maize and rice breeding respectively have developed. The need is stressed for a study of recessive mutations as well as dominant characters in rice and of no longer limiting genetical studies solely to characters of practical importance. The artificial induction of mutation should be included in the technique of breeding and existing varieties should also be thoroughly analysed. Co-operation between the geneticists in various countries is of great importance as is also a uniform system of gene nomenclature for which the writer proposes the establishment of a central organization at, for example, Taihoku.

147. KADAM, B. S. and
PATANKAR, V. K. 633.18:575.11:581.6
Inheritance of aroma in rice.
Chronica Botanica 1938 : **4** : 496–97.
In the cross Kolamba-226 (non-scented) x Sukhadasi (scented) three genes, O_a, O_b and O_c, were responsible for the scented condition, the F_2 ratio being 27 scented:37 non-scented. This ratio was confirmed in F_3.
In other rice crosses 3:1, 9:7, 27:37 and 81:175 ratios of scented to non-scented plants were obtained.

148. MORINAGA, T.,
NAKAJIMA, K. and 633.18:575.11.061.1:581.48
YUMEN, T. 633.18:578.088.1
[The size and form of rice caryopses, and their mode of inheritance. (Preliminary note)].
Jap. J. Genet. 1939 : **15** : 225–35.
If the lemma and palea are cut off soon after anthesis, the rice caryopsis develops into a peculiar shape that is characteristic of the variety concerned. These "free" caryopses were claw-shaped in *indica* and straight in *japonica* type varieties.
"Free" caryopses of the variety Tankóhoira gave a strong colour reaction with phenol, whereas normal caryopses do not show this reaction in any varieties tested. The free caryopses have a thicker pericarp than the normal.
In reciprocal crosses between types with caryopses of differing size and shape, the F_1 free caryopses always resembled the maternal type. In F_2 there were no essential differences between reciprocal hybrids, and the variation curves for the free caryopses were bimodal or trimodal, whereas the curves for the normal F_2 and for the F_1 and parental caryopses were unimodal. It is considered that Mendelian segregation occurs, but that its expression is limited to some extent by the pericarp membrane. In normal caryopses it is entirely repressed by the mechanical effect of the enclosing glumes and pericarp.
The character of phenol colouring behaved as a partial dominant. As the pericarp is the tissue affected, F_1 caryopses were of the maternal type and the F_2 reacted intermediately.

149. 633.18:575.242–181:581.48:581.162.5
KAGAWA, F. 633.18:575.246
Studies on the inheritance of a type of large-grained, partially sterile rice plant.
Jap. J. Bot. 1939 : **10** : 1–33.

A partially sterile mutant type with large grains found in a culture of the upland rice variety Urasan is shown to be a simple recessive to the normal, the gene concerned frequently mutating back to the normal condition.

A new fertile type with dwarf grains and reduced plant height was obtained as a mutant of a large-grained, partially sterile plant.

150. MIDUSIMA, U. and 633.18:582
YAMADA, T. 633.18:581.162.5:581.43:575.11–181.12
(Some considerations on the relation between F_1 sterility and mesocotyl length among Japanese and foreign rice varieties, *Oriza sativa* L.).
Jap. J. Genet. 1939 : **15** : 14–18.

The writers have continued the investigation on mesocotyl length to test Hamada's theory (cf. Abst. 151 below).

Though some of the data obtained showed partial agreement with those of Hamada, the authors conclude that the establishment of the two sub-species *japonica* and *indica* on the basis of mesocotyl lengths has no relation to the affinity between the varieties crossed and therefore is not valid. Moreover, a study of inter-varietal crosses at various stations indicated that mesocotyl length is determined by a certain number of genes—how many is not known—and different lengths, irrespective of sterility, can be produced by artificial or natural crossings.

151. TERAO, H. and 633.18:582
MIDUSIMA, U. 633.18:575.12:581.162.5
(Some considerations on the classification of *Oriza sativa* L. into two subspecies, so-called *Japonica* and *Indica*).
Jap. J. Genet. 1939 : **15** : 10–13.

In a study of the inheritance of sterility in *O. sativa*, 12 Japanese and four foreign varieties were used to obtain 141 crosses in different combinations.

It was found that: (1) The F_1 hybrids from crosses between Japanese and foreign varieties ear later than their parents and also exhibit heterosis, so that, if left to grow alone, earing occurs too late for seed to be set; but by short-day treatment, it is possible to distinguish true genetic sterility; (2) short-day treatment has practically no effect on normal pollen formation; (3) percentage of normal pollen corresponded generally to percentage of normal embryo sacs and can therefore be used to determine the latter.

The experiments showed a fertility range of 0 to 80 per cent in the F_1 plants from crosses between Japanese and foreign varieties, in contrast to those of Kato, who found less than 30 per cent fertility in the F_1 from crosses between Japanese and Indian varieties and the maximum percentage of normal pollen to be 43.

It is concluded that the relations as regards the affinity between Japanese and foreign varieties and also between foreign varieties themselves must be extremely complex—as evidenced by the degree of sterility or fertility—and there is no justification for establishing the two sub-species *japonica* and *indica* merely on the basis of F_1 sterility phenomena. The further suggestions of Kato and others that morphological characters such as grain shape, leaf colour and pubescence may be used to distinguish the two sub-species is rejected by the writers as not proved; and so is Hamada's attempted discrimination based on the elongation of the mesocotyl in darkness at 30° C. (cf. Abst. 150 above).

152. Åkerberg, E. 633.21:581.163
Apomictic and sexual seed formation in *Poa pratensis*.
Hereditas, Lund 1939 : **25** : 359–70.

About 90 per cent of the progeny of apomictic plants of *P. pratensis* are matroclinous; the remaining individuals are aberrant in character and arise sexually, their chromosome numbers indicating that some are produced by the fertilization of reduced and others of unreduced female gametes. These aberrant plants apparently reproduce sexually, for their progenies are very variable; moreover, the chromosome numbers of their progenies suggest that the latter arise from the fertilization of both reduced and unreduced female gametes. One of the parent plants investigated, No. 709, behaved like the aberrant plants in giving variable progeny; in this case, however, the chromosome numbers of the progeny showed them to be produced by fertilization of reduced gametes. When this plant was pollinated by *Poa glauca* a seedling was obtained with about 42 somatic chromosomes. Since the seed parent had about 90 chromosomes, the offspring probably arose parthenogenetically from a reduced female gamete.

Families raised from 44 panicles collected in the wild have been examined and 37 were uniform, with a small proportion of aberrants, while the remaining 7 families were very variable and are assumed to have been produced sexually.

Embryological studies showed that in an apomictic biotype a nucellar cell takes over the function of the megaspore which would normally develop into the embryo sac, but in No. 709, the sexual parent mentioned above, no evidence of aposporic embryo-sacs could be found. In general, reproduction in *Poa pratensis* may take place with or without apospory and with or without fertilization.

As would be expected from the observations on embryology, twins due to polyembryony were about three times as frequent in apomictic as in sexual biotypes. J. L. F.

153. Sullivan, J. T. and 633.263:576.356.5:581.192
Myers, W. M. 633.263:576.356.5:581.04
Chemical composition of diploid and tetraploid *Lolium perenne* L.
J. Amer. Soc. Agron. 1939 : **31** : 869–71.

By colchicine treatment of seeds of *L. perenne*, plants were obtained which were chimaeras of diploid and tetraploid tissue. From five of these both diploid and tetraploid clones were established, making it possible to investigate chemical compositions of plants which differed solely in degree of polyploidy. Using the *t* test the tetraploids were found to be significantly higher in reducing sugars, sucrose, total sugars (all expressed as percentage of dry weight) and also higher in proportion of dry weight soluble in 80 per cent alcohol. The tetraploids tended to be lower in alcohol-soluble nitrogen and total nitrogen and in percentage of dry weight, but not significantly so. There were no consistent differences in total dry matter or crude fibre. J. L. F.

154. Cugnac, A. de and
Belval, H. 633.289:575.127.5:581.192.2
Hybridation entre deux genres de Graminées caractérisés par des glucides différents: fructoholoside et fructoglucoholoside. Nature du glucide formé chez l'hybride. (**Hybridization between two genera of the Gramineae characterized by different carbohydrates: fructoholoside and fructoglucoholoside. Nature of the carbohydrate formed by the hybrid**).
Bull. Soc. Chim. Biol., Paris 1939 : **21** : 689–94.

This paper is similar in substance to that summarized in "Plant Breeding Abstracts", Vol. IX, Abst. 756.

155. 633.31/37:576.356.5:632.3
635.65:576.356.5:632.3
633.31/37:576.312.35

WIPF, L.

Chromosome numbers in root nodules and root tips of certain Leguminosae.

Bot. Gaz. 1939 : **101** : 51–67.

Infected cells of root nodules of 31 diploid species of *Lathyrus, Medicago, Melilotus, Pisum, Trifolium* and *Vicia* all showed the tetraploid number of chromosomes, whereas uninfected cells of the nodular cortex had the normal diploid number. Various polyploid races of *Melilotus, Medicago* and *Trifolium* also had double the somatic number of chromosomes in the infected cells of the nodules. This chromosome doubling associated with infection appeared perfectly regular, and no mitotic irregularities were observed.

The chromosome numbers of the following species were reported for the first time: *Melilotus altissima, M. caspia* and *M. gracilis*, $2n = 16$; *Trifolium agrarium*, $2n = 14$; *T. dubium* and *T. involucratum*, $2n = 28$.

156. JANNACCONE, A. 633.35:575(45)

Selezione della veccia. (**Vetch selection**).

Servizio delle Sementi 1939 : 14–40.

The vetches formerly sown were exceedingly mixed and in 1935 mass selection was started on the basis of seed form and colour. The proportions of the different types occurring in a sample are indicated.

The process of flowering is described. Bagging showed the flowers to be perfectly self-fertile. The 16 groups isolated were studied with regard to rate of germination and of flowering, number of leaves, erectness, abundance of tendrils and frost resistance.

In form and number of leaves and in flower characters the plants derived from round seeds were quite different from all others, having, for instance, pedunculate as opposed to sessile inflorescences and being almost devoid of tendrils. Such forms were classed as *Vicia bithynica* L. and no further breeding work is being done with them. The other forms distinguished all proved to be different varieties of *V. sativa*; the types of individuals occurring in the progenies of seeds of different type are recorded. Sub-cylindrical and flattened seeds mainly gave rise to progeny of the same type, while oval seed form seemed to be a position effect and was not reproduced. Mainly the sub-cylindrical forms were retained for further breeding. Some of the seed colours were not reproduced purely in the progeny. Further selection was carried out on the basis of plant characters; all forms not belonging to the variety *vulgaris* were eliminated. Eight selections were made and data are presented for the times of flowering and yields of these eight purified strains. All proved to be superior in yield, vigour of germination and of growth, but inferior to *V. bithynica* in resistance to late frosts on account of their earliness.

157. FOWLDS, M. 633.366:581.48:575.11.061.6

Seed color studies in biennial white sweet clover, *Melilotus alba*.

J. Amer. Soc. Agron. 1939 : **31** : 678–86.

The normal yellow seed of sweet clover has a yellow embryo and a yellow seed coat. A green-seeded variant has a green embryo and a green seed coat; these differences are controlled by a single gene pair *Y–y*, the normal being dominant. Owing to the difference in generation between the embryo and seed-coat and the translucency of the latter, pale green types are found which combine a yellow embryo with a green seed coat and vice versa; these types do not breed true.

Another variant had pale yellow seed, the colour resulting from a white seed coat on a yellow embryo. This type is also recessive to normal, but the exact mode of inheritance is not known. When this type is crossed with the green seeded type the F_1 plants produce seed with yellow seed coats.

Observations on cross-pollination were made in the course of the work and seed harvested from a small plot of green-seeded plants showed 10 per cent cross pollination at a distance of 200 feet from a small group of yellow seeded plants. J. L. F.

158. 633.41:576.16:581.9
633.63:576.16:581.9
ZOSSIMOVICH, V. P.
Evolution of cultivated beet *B. vulgaris* L.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 73–76.
Beet was probably first cultivated in Iraq for use as a leafy salad plant and this form (ssp. *cicla*) first spread into western Europe, where it hybridized with local wild beet of high sugar content. Later, root-yielding beets were cultivated in Arabia and were brought to western Europe at the time of the Crusades. Hybridization of these root-yielding forms with ssp. *cicla* then led to the production of the sugar beet.

159. 633.41:576.354.4:575.129:576.16
633.41:576.354.4:575.127.2
ZAIKOVSKAJA, N. E.
Reduction division in interspecific hybrids in the genus *Beta* L. II. Cytological evidence on the question on experimental synthesis of the species *Beta trigyna* W. et K. (2n=54).
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **23** : 944–48.
Cytological evidence is presented which supports the view of Zossimovich (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1088) that *B. trigyna* is a natural amphidiploid of *B. lomatogona* and *B. corolliflora*. At diakinesis *B. trigyna* showed 22 to 27 bivalents and 0 to 10 univalents, whereas the synthetic *B. lomatogona* x *B. corolliflora* amphidiploid showed 18 to 22 bivalents and 10 to 18 univalents, the lower degree of pairing being attributed to its recent origin. Data on microspore formation are also given, as well as on meiotic behaviour in *B. corolliflora*, *B. lomatogona* x *B. corolliflora* F_1 and *B. lomatogona* x *B. trigyna*.

160. 633.41:581.9:576.16:576.312.35
ZOSSIMOVICH, V. P.
Eco-geographical characteristic of the wild species of beet (*Beta* L.).
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 69–72.
The wild beet species are described and their geographical distribution discussed. They are grouped into three sections and their chromosome numbers are listed where known.

161. 633.491:575
CLARK, C. F.
Potato breeding investigations in 1938: Review of literature.
Amer. Potato J. 1939 : **16** : 212–20.
An annual survey of the literature; the relevant papers have been reviewed in "Plant Breeding Abstracts". J. L. F.

162. 633.491:575(78.4)
MATTSON, H.
Breeding potatoes for North Dakota.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1939 : **1** : No. **3** : 37–39.
Work on the production of improved disease-resistant potato varieties has been in progress for nearly a century. Many good varieties however are not eminently suited to conditions in North Dakota and the North Dakota Agricultural Experimental Station is in the process of producing varieties adapted to local conditions.
An outline of the experimental and field work follows, with some account of the difficulties encountered. J. G. H.

163. 633.491:575.127.2:576.354.4:575.11
BECKER, C. L.
Inheritance studies in the interspecific cross *Solanum demissum* Lindl. x *S. tuberosum* L.
J. Agric. Res. 1939 : **59** : 23–39.
A study was made of the inheritance of several characters in the cross *S. demissum* Lindl. ($2n = 72$) x *S. tuberosum* L. ($2n = 48$). F_1 hybrids with the expected chromosome number $2n = 60$ showed great irregularity at meiosis; non-orientated and lagging chromosomes were common. F_2 families from the sufficiently fertile F_1 plants varied in their chromosome numbers, cotyledon measurements, stem diameter, heat injury, maturity, frost injury, stolon

length, number of tubers and weight of largest tuber in either direction almost to the two original parent species, with a mean falling half way between the two parental means. The height of mature plants and internode lengths of the F_2 families more resembled *S. demissum* while the crop weight was similar to the *S. tuberosum* variety. Terminal leaflets and mature leaves were larger than those of either parent. J. G. H.

164. Ivanovskaja, E. V. 633.491:576.354.4:576.356.5
Cytological study of *Solanum Millanii* Buk. et Lechn.
C. R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 389–91.

The chromosome behaviour at meiosis of *S. Millanii*, a wild frost-resistant Argentine potato with 36 chromosomes was studied in order to elucidate something of its taxonomic relationships. From the meiotic irregularities observed (uni-, bi- and quadrivalents, bridges etc.) and the morphological similarity to *S. chacoense* Bitt., a diploid from the same region, it was concluded that *S. Millanii* has probably originated from an unreduced *S. chacoense* gamete fertilized by a haploid gamete of some nearly related diploid species. J. G. H.

165. Kröner, W. and
Schmalfuss, H. 633.491:581.6:575
Das Dunkeln der Kartoffel; Züchtung und Verarbeitung nichtdunkelnder Kartoffeln. 2. Mitteilung. Auswahl geeigneter Kartoffelsorten für Trockenspeisekartoffeln. (**Darkening of potatoes: breeding and production of non-darkening potatoes. Part 2. Choice of suitable varieties for drying**).
Vorratspfl. u. Lebensmittelforsch. 1938 : **1** : 691–93.

The importance of producing potatoes which, when sliced for drying and storing, do not turn dark is again emphasized (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 314). The rate at which a number of varieties darken has been tested and Frühgold was found to darken slowest and least, Parnassia quickest and to the greatest degree. Certain other varieties as well as Frühgold were classed as suitable for preparing dried potatoes.

166. Lunden, A. P. 633.491–2–1.521.6:575
Mål og metoder ved foredlingsarbeidet for sykdomsresistens hos poteten (*Solanum tuberosum*). [**Objects and methods in breeding for disease resistance in the potato (*S. tuberosum*)**].
48. Årsmeld. Norges LandbrHøisk. Åkervekstdorsøk 1939 : 1–16.

A concise but comprehensive account of the problems involved in breeding potatoes for resistance to various diseases. Among the aspects dealt with are the definition of resistance, terminology, varietal differences in resistance, various diseases and their causal organisms, physiological specialization in fungi, methods of infection, disease-resistant potatoes from S. America and Mexico and their use in potato breeding in various countries, and the factorial basis of resistance to certain diseases. Though there is no bibliography the authorities are cited and the author's own findings recorded in several instances.
The importance of a thorough understanding of the biology of the fungi concerned and of the potato plant is stressed as well as the need for close co-operation between the breeder and the plant pathologist.

167. 633.491–2.3–1.521.6
Dorst, J. C. 575:578.08
Schurftaantasting bij nakomelingen van verschillende aardappelkruisingen. (**Scab infection in the progenies of different potato crosses**).
Tijdschr. PlZiekt. 1939 : **45** : 157–61.

An attempt to show how differences in the susceptibility of progenies of potatoes to scab (*Actinomyces scabies*) can be numerically expressed and graphically demonstrated in the form of curves. The method should eliminate some of the subjective element in estimating the amount of infection among different strains. The principle could be applied to comparative studies of other characteristics.

168. Noll, A. 633.491–2.3–1.521.6
Untersuchungen über die Biologie und Bekämpfung des Kartoffelschorfes (*Actinomyces*). [**Investigations on the biology and control of potato scab (*Actinomyces*)**].
Landw. Jb. 1939 : **89** : 41–113.
A detailed study of the effects of infection with common scab (*Actinomyces*) and of the conditions influencing the amount of infection, based on observations of 47 potato varieties grown at eight stations in Germany.
Resistance to scab was negatively correlated with the ability to form wound callus on cut tuber surfaces, and was also correlated with the structure of the lenticels. Resistant varieties showed little scab infection on the buried portion of the tops. Resistance was not correlated with russetting of the tubers, length of the vegetation period, rate of growth of the tubers, *p*H of pulped tuber extract, or with rate of growth of the pathogen on a tuber extract medium.

169. Reddick, D. and
Mills, W. R. 633.491–2.411.4–1.521.6
Blight immune *versus* blight resistant potatoes.
Amer. Potato J. 1939 : **16** : 220–24.
Evidence is presented that the building up of virulence of *Phytophthora infestans* previously demonstrated in the laboratory (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1126) can occur in the field when certain resistant strains are open to infection. It is therefore urged that such strains should not be released to growers. J. L. F.

170. 633.491–2.411.4–1.521.6:575(75.6)
633.491–2.7–1.521.6:575(75.6)
Station develops new Irish potato. Tests show heavy production qualities and resistance to insects and diseases.
Ext. Farm-News 1939 : **24** : No. 12 : p. 4.
The new potato variety Sequoia was developed at the Central Experiment Station, North Carolina, from a cross of Green Mountain and Katahdin. It has out-yielded all other varieties in the State and is resistant, though not immune, to leaf hoppers, flea beetles and late blight. It is a late variety.

171. Schaper, P. 633.491–2.7–1.521.6:575.127.2
Arbeiten und Probleme zur züchterischen Bekämpfung des Kartoffelkäfers. I. Ergebnisse der Prüfung deutscher Kultursorten auf das Verhalten gegen den Kartoffelkäfer im freien Befall. II. Untersuchungen über das Verhalten verschiedener *Solanum*-Arten gegen den Kartoffelkäfer. III. Resistenz und Anfälligkeit verschiedener Hybriden der Gattung: *Solanum* gegen den Befall und Frass des Kartoffelkäfers. (**Researches and problems connected with the control of the Colorado beetle by breeding. I. Results of tests of the German domestic varieties for reaction to the Colorado beetle in the open. II. Investigations on the reaction of various *Solanum* species to the Colorado beetle. III. Resistance and susceptibility of various hybrids of the genus *Solanum* to being attacked and devoured by the Colorado beetle**).
Z. Pflanzenz. 1939 : **23** : 239–322.
The first results of the joint researches of the German and French investigators on the Colorado beetle are here reported. Preliminary tests on the collection of cultivated potato varieties showed all domestic varieties to be susceptible. A certain degree of resistance was observed in the following varieties, which are therefore possibly promising for breeding: Aal, Weltwunder, Condor, Fram, Wohltmann. The influence of various cultural measures upon the degree of infestation is discussed.
The primitive *Solanum* species varied in reaction and one group of fully resistant species was detected; some species, e.g. *S. Caldasii* and *S. Commersonii*, proved definitely poisonous to the insects. *S. demissum* was resistant, more so in some varieties than in others; resistance was

also found in *S. Jamesii*, *S. polyadenium* and *S. Henryi*. Some races of *S. chacoense* were much more susceptible than others. The laboratory results were in agreement with observations in the open field.
Similar observations on hybrid clones showed many of the *S. demissum* x *S. tuberosum* hybrids to be resistant. Certain hybrids of *S. acaule* x *S. tuberosum*, both susceptible species, showed a high degree of resistance. A number of triple hybrids *S. acaule* x *S. demissum* x *S. tuberosum* also proved resistant; 12 clones were classed as resistant among 136 hybrids of *S. chacoense* x *S. tuberosum*. Hybrids of *S. tuberosum* with *S. andigenum* were nearly all susceptible, though at least one proved unexpectedly resistant and gave a high yield of good tubers; this plant is to be used for further crossing. Hybrids of *S. tuberosum* x *S. tuberosum* were all susceptible, those of *S. polyadenium* x *S. Jamesii* highly resistant.
In all, 42 out of 215 hybrids proved resistant in the 1937 tests and 143 out of 1369 in 1938.

172. Trouvelot,
Müller-Boehme and
Lacotte. 633.491–2.7–1.521.6:575.127.2
Remarques sur le comportement du Doryphore *Leptinotarsa decemlineata* Say. sur des hybrides *Solanum demissum—Solanum tuberosum*. (Première note).
[**Remarks on the behaviour of the Colorado beetle *L. decemlineata* Say. on some hybrids *S. demissum—S. tuberosum*. (First note)**].
Rev. Pathol. Vég. 1938 : **25** : 273–76.

Feytaud, J.,
Schwartz, M. and
Trouvelot, B.
Un exemple de collaboration internationale pour l'étude en commun de la lutte contre le doryphore ; la recherche de solanées résistantes. (**An example of international collaboration for the combined study of protection against the Colorado beetle: the search for resistant *Solanum* species**).
Rev. Zool. Agric. 1938 : **37** : 65–68.
The hybrids ranged between the parental limits with respect to attacks by *L. decemlineata*, some approaching *S. demissum* in resistance. On these resistant types larval development was so slow and defective that the plants did not suffer appreciable damage under field conditions. Since these hybrids did not compare with *S. tuberosum* in yield of tubers, further crosses are to be made.

173. 633.492:575.247.061.6:581.43
Kagawa, F. 633.492:575.255
Chimeras in sweet potatoes.
Jap. J. Bot. 1939 : **10** : 43–54.
Somatic mutations of storage roots from red to white are reported. The mutations also involved the presence of anthocyanin in other plant parts, and it was found that red plants had larger leaves than white ones.
A chimaera involving a mutation from presence to absence of carotin in storage roots is also described.

FIBRES 633.5

174. Chen, Y. S. 633.51:575(51)
(**Hopei cotton improvement and the future of the Stoneville No. 4**).
Agric. Sci., Peking, June, 1939 : Pp. 77.
Regional variety tests have shown that Stoneville No. 4 is the best American cotton for the provinces of North China south of Peking. Breeding work has been carried on by the Hopei Cotton Improvement Institute to remedy the defects of this variety such as its susceptibility to diseases and lateness in the northern part of Hopei. Most of the work has been destroyed in the Sino-Japanese war but the remaining material has been preserved and more selections and crosses have been made.

The writer stresses the importance of cotton breeding in North China and gives a comprehensive review of the position of cotton cultivation there. J. L. F.

175. 633.51:575(67.5)
Les résultats de la sélection cotonnière. (**The results of cotton selection**).
Agric. Élev. Congo Belge 1939 : **13** : 139–40.
The new pedigree cottons have proved superior in staple length, some of the most promising lines being mentioned. Some of these, e.g. 145 C.55 and 145 C, are superior also in yield, which more than counterbalances a slight deficiency in ginning percentage.

176. Capinpin, J. M. and Khambanonda, I. 633.51:575.127.2:576.356
Studies on the cytology and cross-compatibility of some cotton varieties.
Philipp. Agric. 1939 : **28** : 163–86.
Crosses were made or attempted between *Gossypium barbadense* L. (Sea Island and Pima Egyptian), *G. punctatum* Sch. et Thon. (Batangas White, Batangas Light Brown and Batangas Dark Brown), *G. paniculatum* Blanco (Ilocos Brown) and a wild cotton collected in the Philippines and provisionally ascribed to *G. obtusifolium* Roxb. The first four species were shown to be tetraploids ($2n = 52$) while the wild species was diploid ($2n = 26$).
It was found that crosses between the tetraploids were successful but no hybrids between these and the diploid species were obtained. No seeds were obtained from about 200 pollinations using the diploid wild species as male parent while from the reciprocal crosses, involving 140 pollinations, only one sound seed was obtained, from the cross wild cotton x Ilocos Brown; this seed failed to germinate.
The F_1 hybrids between the tetraploid species had $2n = 52$. J. L. F.

177. Lappo, A. I. 633.52:575:578.08
(**A brief review of work of the Division of Plant-Breeding and Seed Culture for the years 1936-1937**).
Ann. White Russian Agric. Inst., Gorki 1939 : **8** (30) : 50–53.
By cutting down flax plants at the time of flower bud formation a greatly increased branching is induced and consequently a greater rate of seed production. It is also possible to induce the formation of a second crop of seeds by cutting the plant down just before maturity.

178. Miljan, A. 633.52:575.42(47.4)
"Eliit" Jõgeva Sordikasvanduse kiulinasort. (**"Eliit" new variety of fibre flax of the Plant Breeding Station Jõgeva**).
Jõgeva Sordikasvanduse toimetised, Tallinnas 1939 : No. 93 : Pp. 8.
The new variety Eliit was obtained by pure line selection from a local variety at the Plant Breeding Station, Jõgeva, Estonia. Its vegetation period is a little longer than the standard varieties Petseri Long and Blenda. Its straw is stiff, tall and thin and it has exceeded Petseri Long by 5 per cent in yield of stem and 13·8 per cent in yield of seed. The average percentage of fibre in field retted stems is 15·8 per cent, as compared with 14·7 per cent for the standard varieties. The quality of fibre is high. The 1000-grain weight is 4·26 grm. and in the last year of testing the seed contained 28·2 per cent of protein and 39 per cent of oil on a dry weight basis. The iodine number was 173·5.

179. Dona' dalle Rose, A. 633.52:576.356.5:581.04
La colchicina come stimolante mutativo su lino (*L. usitatissimum*).
[**Colchicine as an agent stimulating mutation in flax (*L. usitatissimum*)**].
Ital. Agric. 1939 : **76** : 695–702.
The method of employing colchicine is described and the literature on the subject and on the cytology of *Linum* is reviewed. The author's own experiments have confirmed the number $n = 15$ for *L. usitatissimum.*

The seedlings obtained by treatment with colchicine solutions of 1 and 0·5 parts per thousand showed the characteristic root swellings and a total absence of geotropic response; their growth rate was also retarded. Some came to maturity and according to pollen size appeared to be tetraploid. Evidence of gigantism was seen also in the other organs of the plants. The increased length of stem and size of capsule are regarded as characters of possible practical importance.

180. Postma, W. 633.522:576.356:581.04
Opmerkingen over de cytologie van normale en van met colchicine behandelde *Cannabis* planten. (**Observations on the cytology of normal and of colchicine-treated *Cannabis* plants**).
Erfelijkheid in Praktijk, Leiden 1939 : **4** : 171–73.

In this lecture the author agrees with Langlet's explanation of the tetraploid cells in the perikem tissue in *C. sativa* as being due to chromosome division being arrested at metaphase. Evidence is advanced suggesting that the single satellited chromosome found in diploid cells of hemp is the male sex chromosome. Root tips whose cells lack the odd satellited chromosome are probably from female plants (with two *x* chromosomes).
The stem of the plant is apparently diploid throughout though the possibility of occasional tetraploid cells occurring is admitted.
Following colchicine treatment of hemp seed, nuclei with 80 chromosomes were found in the perikem tissues. In one cell in which only half the number of chromosomes had been doubled 30 chromosomes were found including two satellited chromosomes which from their position appeared to have arisen by division of the single satellited chromosome in the diploid cell.
The action of colchicine in relation to spindle formation, division of the chromosomes the rate of cell division and root thickness is also discussed.
With acenaphthene the author has so far failed to obtain chromosome duplication in hemp, but the experiments are being continued.

181. 633.528.2:576.312.35:576.354.4:576.312.34
Mudra, A. 633.528.2:576.356.5
Câteva observaţiuni asupra cromozomilor la buretele vegetal (*Luffa cylindrica* Roem.). (**Some observations on the chromosomes of the vegetable sponge (*L. cylindrica* Roem)**).
Bul. Fac. Agron. Cluj (1938) 1939 : **7** : 169–71.

The chromosome number is 2*n* = 26, though in one root tetraploid (2*n* = 52) cells were found. The chromosomes are very small and without marked differences in shape and size. A typical cell had 11 ring and 2 rod bivalents, mostly with sub-terminal chiasmata.

SUGAR PLANTS 633.6

182. 633.61:575(73)
Release of sugarcane varieties C.P. 29 103 and C.P. 29 120.
Sug. Bull., N.O. 1939 : **18** : No. 1 : p. 4.

Taggart, W. G. and
Arceneaux, G.
An evaluation of C.P. 29–103 and C.P. 29–120.
Sug. Bull., N.O. 1939 : **18** : No. 2 : 2–3.

Gibbens, R. T. (Jr)
Stokes, I. E. and
Krumbhaar, C. C.
Results of tests of C.P. 29–103 and C.P. 29–120.
Sug. Bull., N.O. 1939 : **18** : No. 3 : 4–5.

The two new varieties are richer than Co 290 in sugar but lower in yield of cane and sugar per acre. C.P. 29 103 can be stripped easily and has shown only occasional cases of mosaic, but it is susceptible to red rot and moderately so to root rot. It is somewhat larger than C.P. 29 116 in stalk diameter.

C.P. 29/120 compares favourably with C.P. 28/19 in stalk diameter but is difficult to strip. It is moderately susceptible to red rot, but resistant to root rot. Mosaic has been rarely observed and does not seem to spread rapidly.
The varieties are somewhat better than Co. 290 in maturing qualities.

183. MERCADO, T. 633.682:575.247
A comparative study of two bud sports of cassava and their parent varieties.
Philipp. Agric. 1939 : **28** : 308–20.
The two bud sports studied were a non-variegated mutant of a variegated variety and a non-curly mutant of a variety with curly leaves.
The bud sports produced higher yields of storage roots and starch than the parents, and larger and longer stalks. This is held to indicate that improvement of cassava may be effected by selecting such bud sports.
Nineteen new bud sports (mostly reverse mutations) were observed in the 2,462 plants studied.

STIMULANTS 633.7

184. ANDERSON, E. 633.71:575.127.2
Recombination in species crosses.
Genetics 1939 : **24** : 668–98.
The inheritance of corolla characters was studied in the cross between *Nicotiana alata* and *N. Langsdorffii*. The F_2 recombinations of the characters tube length, limb width, degree of lobing and style length are described diagrammatically, graphically and by correlation coefficients. It is emphasized that the recombinations obtained are a small fraction of the total imaginable recombinations and the causes of this restriction of recombinations are discussed under the headings gametic elimination, zygotic elimination, pleiotropism and linkage. The effect of linkage is shown theoretically to be particularly strong, on the assumption that any character inherited in quantitative fashion may be controlled by a number of genes of the order 100 to 200, while the number of chromosomes is limited.
Certain recommendations for practical breeding procedure are deduced. When different quantitative characters from two different forms, e.g. flower size and hardiness, are to be combined, the F_2 progenies would be most advantageously produced by crossing the hardiest of all the F_2 plants with flowers like the large flowered parent with the largest flowered F_2 plants as hardy as the hardier parent. When only one character is concerned, e.g. yield, the author would assume that any other, easily measured, quantitative character was linked with the desired character and by choosing different quantitative characters to act as markers for the genes of the two parents, in a manner analogous to the use of a single factor character to mark a piece of a chromosome, the procedure outlined for the combination of different characters could then be followed. J. L. F.

185. KOSTOFF, D. 633.71:575.127.2:581.162.5:576.356
Lethality of gametes as dependent on the exchange of segments between partly homologous chromosomes in a *Nicotiana* species hybrid.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 372–73.
A reprint of the article summarized in "Plant Breeding Abstracts", Vol. IX, Abst. 1322.

186. SMITH, H. H. 633.71:576.356.5:575.129:581.04
The induction of polyploidy in *Nicotiana* species and species hybrids by treatment with colchicine.
J. Hered. 1939 : **30** : 291–306.
By colchicine treatment of seeds or meristems, chromosomal doubling was induced in *N. glauca*, *N. rustica*, *N. Tabacum*, F_1 (*N. Tabacum* x *N. glauca*), F_1 (*N. Tabacum* x *N. silvestris*), F_1 (*N. glutinosa* x *N. glauca*) and in *N. rustica* x *N. Tabacum* segregates. Full details of the effects of the various treatments tried are given.

The autopolyploids obtained were smaller than the corresponding diploids and had smaller, thicker leaves with larger stomata, larger pollen and increased pollen sterility. Allopolyploids of *N. Tabacum* x *N. glauca* and *N. Tabacum* x *N. silvestris* were similar in size to the undoubled plants and pollen sterility was reduced from 95 per cent or more to 65 and 25 respectively. Abundant seed was produced. Allopolyploids of the dwarf *N. glutinosa* x *N. glauca* F_1 showed marked increases in plant vigour and size and in pollen fertility.
Progenies of the above polyploid derivatives are being grown to determine whether an increase in fertility is observable in later generations.
It is suggested that induced polyploidy in *Nicotiana* may be valuable economically in the following ways: (1) for the transference of resistance to downy mildew from Australian species to *N. Tabacum*, (2) for the production of forms rich in anabasine from *N. Tabacum* and *N. glauca*, (3) for the production of vigorous forms rich in nicotine from *N. Tabacum* and *N. rustica*.

187. 633.71:576.356.5:577.17:581.04

GREENLEAF, W. H. 633.71:575.127.2:575.129:581.162.51

Induction of polyploidy and sterility in amphidiploids induced by hetero-auxin treatment.

Amer. J. Bot. 1939 : **26** : p. 673. (Abst.).

Continuing the researches summarized in "Plant Breeding Abstracts", Vol. VIII, Abst. 905 and Vol. IX, Abst. 809, the author reports that amphidiploid *Nicotiana silvestris* x *N. tomentosiformis* and *N. silvestris* x *N. tomentosa* were completely female sterile, though the pollen was good and megasporogenesis was regular. This was due to early degeneration of the embryosacs. The degeneration was similar to that observed in F_1 hybrids, but the latter also have irregular meiosis. It is suggested that Kostoff's fertile *N. silvestris* x *N. tomentosiformis* allopolyploid was a somewhat altered amphidiploid, perhaps the result of pairing in the F_1 hybrid.

188. 633.72:581.162:581.165.1:575.42(92.2)

VOLLEMA, J. S. 633.912:581.165.1:575.42(92.2)

Overzicht van de voornaamste cultuurtechnische werkzaamheden van het Proefstation West-Java in de laatste jaren. (**Survey of the main agronomic activities of the West-Java Experiment Station in recent years**).

Bergcultures 1939 : **13** : 1034–42.

The effects of the centralization of the experiment station work on tea, rubber and cinchona at the West-Java Experiment Station are briefly mentioned.
In research on tea Van Emden has been successful in raising two plants from one seed by the method Ramaer used for rubber. The study of vegetative propagation has shown clonal differences in budding capacity.
Wellensiek's method of artificial pollination has been further elaborated by Van Emden. Cross-pollination has given a set of 12 per cent (i.e. the number of seeds germinated per 100 flowers pollinated). Artificial selfing resulted in a set of only 2½ per cent. Nursery selection of tea plants, though of some value (where plenty of cheap seed is available) as a means of securing vigorous plants in the early years of production, does not in the author's opinion guarantee the selection of inherently and permanently vigorous individuals. The method is, however, of importance in obtaining homogeneity in plants to be raised for use as stocks. An extensive series of local tests of the most promising clones on the estates is to be undertaken.
A simple practical method of promoting rapid germination of tea seed has been evolved by which 100 per cent burst seeds can be obtained within 3 weeks in a lot of tea seed. With untreated seed only 40 per cent had burst after 45 days. The treated seed gave 85 per cent success in the seed bed.
As regards rubber the importance is stressed of ensuring that plantations of buddings shall contain only genuine types of the particular clones comprising the plantations.

It is hoped that by further selection the undesirable subsidiary characters that still persist in some widely used clones may be eliminated and also that some of the new "second generation clones" being raised may possess only desirable characteristics.

189. CIFERRI, R. 633.73:575.24
Osservazioni su alcune mutanti del *Coffea arabica*. (**Observations on some mutants of *C. arabica***).
Agricoltura Colon. 1937 : **31** : 515–21.
The author describes certain variants found in Dominica and Haiti: (1) a type approaching to Maragogipe in its larger stem, leaves and seeds and capable of growing at low altitudes down almost to sea level; the berries however are not larger than the normal, in which respect this type differs from Maragogipe; it may be a descendant of the original Maragogipe or may have originated independently; (2) *angustifolia* type, varying in the ratio of total length of leaf: maximum width, the type being apparently not fixed; (3) forms bearing yellow berries mixed with red ones, the two occurring together even on one and the same fruiting branch; the proportions vary and the type again would appear to be not fixed; (4) type with pubescent foliaceous petioles, (5) races with elongated and with reduced foliaceous stipules, the former up to 15 mm., the latter down to 5 mm. or less.

190. LELIVELD, J. A. 633.73:581.162
Vruchtzetting bij koffie. (**Fruit setting in coffee**).
Arch. Koffiecult. Ned.-Ind. 1938 : **12** : 127–61. [From Landbouwk. Tijdschr., Wageningen 1939 : **51** : p. 495. (Abst.)]
In the main Robusta clones in cultivation and in other varieties such as Kawisari, Conuga, Uganda, Excelsa, Abeocuta, Liberia and Arabica the process of fertilization proceeds normally. Apart from self-sterility in Robusta and cross-sterility between parents of widely different type, failure to set seed may result from unfavourable weather conditions as a consequence of which too little pollen is available during the short time in which the embryo sac is in a receptive condition.
Physiological aspects of fertilization are discussed, including the effects of soil and climate. Experiments have shown that as far as the generation in which the cross is made is concerned, bean size is determined by the mother plant and not by the pollen parent.
Round beans may be due to genetical differences rendering the development of the embryo sac impossible, or to defective pollination. In the first case selection for types characterized by few round beans is advocated as a remedy, while in the second case suitable mixtures of clones or artificial pollination should be effective.

191. FAGERLIND, F. 633.73:581.48
Perisperm oder Endosperm bei *Coffea*? (**Perisperm or endosperm in *Coffea*?**)
Svensk. Bot. Tidskr. 1939 : **33** : 303–09.
On the basis of an anatomical study of the embryo of *Coffea* at various stages of development the writer refutes Houk's view that the mature seed has no endosperm (cf. "Plant Breeding Abstracts", Vol. VII, Abst. 265 and Vol. VIII, 1284). The significance of this finding as regards coffee breeding is evident.
The propriety of the term perisperm as applied to coffee is also discussed.

192. BONDAR, G. 633.74(81)
A cultura de cacao na Bahia. (**Cultivation of cacao in Bahia**).
Bol. Tech. Inst. Cacao Bahia 1938 : No. 1 : Pp. 205.
An account is given of the history of cacao cultivation, and of its introduction into the state of Bahia. The existing species of *Theobroma* and their varieties are described, with numerous illustrations, and details are given of the methods of cultivation and manufacture.

193. Bredemann, G. 633.75:581.192.6:575:578.08
Beiträge zur Züchtung des Mohnes (*Papaver somniferum* L.) auf hohen Alkaloidgehalt. [**Contribution on the breeding of the opium poppy (*P. somniferum* L.) for high alkaloid content**].
C.R. VI Congr. Int. Techn. Chim. Industr. Agric., Budapest 1939 : **2** : 378–86.

Methods of obtaining the greatest yield of alkaloids from the opium poppy are discussed. Breeding for higher alkaloid content is difficult on the basis of chemical analyses alone, since a relatively large quantity of material is required for analysis and the alkaloid content varies greatly with the growth stage. A simple morphological index of richness in alkaloids is therefore required.
Four varieties of poppy each sown at four different times were studied. There was a significant correlation between alkaloid content and the total area of cross-section of latex tubes in the main vascular bundles of the capsule (cut across in the equatorial region). There was, however, no close correlation with either the number or the mean diameter of latex tubes taken alone.
The area of the latex tube cross-section was correlated with the number of stigmatic lobes, so that the latter may prove to be a useful character for the breeder. The area of the cross-section of the vascular bundles proper (xylem and phloem without accompanying sclerenchyma) was also correlated with that of the latex tubes. The area of sclerenchyma was not correlated with alkaloid content.

OIL PLANTS 633.85

194. Henry, T. 633.85:581.192:578.08
Experiencias en la práctica refractométrica aplicada a la selección de oleaginosas. (**Experiments in the use of the refractometer in oil seed selection**).
Arch. Fitotécn. Uruguay 1938 : **3** : 48–50.

The method described consists in extracting the oil from the ground seed with a preparation known as Halowax Oil. By a simple calculation the oil content of the seed can be deduced from the alteration of the refractive index of the reagent.

195. Hopper, T. H. 633.854.54:575(78.4)
Seed flax production and flax research.
Bi-m. Bull. N. Dak. Agric. Exp. Sta. 1939 : **1** : No. 3 : 17–19.

A brief account is given of the flax breeding programme of the North Dakota Agricultural Experiment Station. This work is done in close co-operation with the plant pathologist and chemist and the characters selected for are disease resistance, yield, suitable plant habit, seed size and oil content and oil drying quality. So many factors are involved that progress is necessarily slow.
The Station is also co-operating with the U.S. Department of Agriculture in testing the influence of variety and climatic factors on flax quality.

196. Kozhin, A. E. 633.854.56:577.8
(**Sex in the tung-oil tree**).
Bull. Batum Subtrop. Bot. Gdn 1938 : No. 4 : 57–99.

The following types of plants have been observed in *Aleurites cordata*: (1) female plants; (2) plants with predominantly mixed inflorescences, most of which (50–70 per cent) bear a large number of female flowers (up to 60 or more per inflorescence); (3) plants bearing very few female inflorescences but mostly mixed inflorescences with a low proportion of female flowers (30 per cent or less) and a number of hermaphrodite flowers; (4) plants with predominantly male inflorescences, a small number of which contain a few female flowers.
In *A. Fordii*, where there is no difference in the form of the male and female inflorescences, similar variations in proportions of flowers of the different sexes per inflorescence, and hence in the total number of flowers per inflorescence and the size of the fruit, were observed.

Innumerable intermediates between the different types were observed in both species. The existence of this great range of intersexes suggests that the populations have arisen from crossing between races differing in sex constitution in Goldschmidt's sense. The basic genetic type can be recognized from the structure of the flowers, the female flowers on female plants having invariably 6 to 7 petals while those on the intersexes have only 5. The proportion of male to female flowers varies in different years and under different conditions and increases with the age of the tree.
For producing the best yielding types for planting it is recommended that seed be obtained from trees of the predominantly female intersexes grown under isolation.

197. 633.854.78:575.127.5:635.24:576.354.4:576.356.2
KOSTOFF, D. 633.854.78:575.129:635.24:576.16
Autosyndesis and structural hybridity in F_1-hybrid *Helianthus tuberosus* L. x *Helianthus annuus* L. and their sequences.
Genetica 1939 : **21** : 285–300.

The hybrid between *H. tuberosus* ($n = 51$) and *H. annuus* ($n = 17$) formed 32 to 34 bivalents and 0 to 6 univalents, except for occasional cells with 8 univalents. Multivalents were rare (one per 38 pollen mother cells). The frequent production of 34 bivalents indicates that one of the genoms of *H. tuberosus* (*Bt*) is homologous with that of *H. annuus* (*Ba*), while the other two *H. tuberosus* genoms (At_1 and At_2) pair autosyndetically. The F_1 may then be represented as $\frac{At_1\ Bt}{At_2\ Ba}$.
In the F_1 that was extensively studied there was a minimum of five inversions.
The F_1 showed considerable sterility (there was only 0·5 to 1 seed per head). It is not considered likely that doubling its chromosome number would give a form fertile enough to produce both seed and tubers, or that it would be easy to transfer the tuber production of *H. tuberosus* to *H. annuus* or the seed production of *H. annuus* to *H. tuberosus*. The most promising approach seems to be the continued inbreeding and selection of the F_1 in order to render it homozygous for the observed structural differences and so to increase fertility.

198. RYBIN, V. A. 633.854.78:576.356.5:581.04
Colchicine-induced tetraploidy in *Helianthus annuus* L.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 368–71.

Chromosomal chimaeras containing tetraploid tissue were obtained in *Helianthus annuus* by immersing seedlings in colchicine solution. One seedling derived from such a plant proved to be tetraploid.

MEDICINAL PLANTS 633.88

199. ESDORN, I. 633.88
Beiträge zur Heilpflanzenforschung. (**On research on medicinal plants**).
Ber. dtsch bot. Ges. 1939 : **57** : 166–75.

After a brief survey of the historical background of the growth of the recognition of the significance and use of medicinal plants, an account is given of biological and especially botanical developments in this field in recent years in Germany and elsewhere. Cultural problems including acclimatization have been studied and selection and breeding operations have been undertaken in various countries with many plants e.g. peppermint, cinchona, tobacco, lupins and poppies.
Since 1936 a critical survey has been undertaken in Hamburg by Esdorn and others to determine which popular herbs have actually medicinal value and monographs are also in course of preparation on individual medicinal plants. The first two of the series have appeared –one by Greve on *Ledum palustre*, and the other by Guckow on *Solidago Virgaurea*. A review of the latter is included in the present paper.

200. Schmöle, J. F. 633.912:581.165.1
Verslag tot ult. 1938 van de toetstuinen van cloonen en zaailingfamilies in Polonia. (**Report to end of 1938 on the test plantations of clones and seedling families in Polonia**).
Arch. Rubbercult. Ned.-Ind. 1939 : **23** : 141–61.

A continuation of the work reviewed in "Plant Breeding Abstracts", Vol. VIII, Abst. 1298. Thirty-three new clones have been included which came into tap in 1938. Before 1931, AV 49 was used as the standard clone and after that year AV 256.
Out of about 200 clones tested, 10 (including AV 456, Pilmoor B 84, PB 23, Tjir 16, AV 464, and AV 470) showed good yields and other promising features. In general the seedlings were superior to the clones in resistance to wind damage and in bast renewal and the best producers among the seedlings were not inferior to the 10 clones mentioned. It must not, however, be concluded that seedlings are of more practical value than clones.
Among the seedlings Nos 163, 185 and 308 were the highest yielders, with 49 x (33 and/or 49) and Nos 152, 157 and 214 from uncontrolled pollinations coming next. All these families and also Nos 33 and 256 (also from uncontrolled pollinations) are stated to be good as regards yield, growth, bast renewal and resistance to wind damage.
Full details of the trials are given in tables which also contain production figures for some monoclone plantations.

201. Jong, W. H. de 633.912:581.165.1(92)
Productiecijfers van den *Hevea*-cloon Gondang Tapen I. (**Production figures of the *Hevea* clone Gondang Tapen I**).
Bergcultures 1939 : **13** : 1087–89.

This clone continues to give good yields (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 411). In addition to the other desirable features previously referred to, the small size of the crown is mentioned and also good growth capacity (under favourable conditions). The occasional stem defect, resulting in a badly formed trunk, becomes very pronounced with age and such types should be eliminated from plantations.

202. Poddubnaja-Arnoldi, V. 633.913:575.127.2:576.354.4:581.162.5
Development of pollen and embryosac in interspecific hybrids of *Taraxacum*.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 374–77.

Successful hybrids were obtained of various combinations of the species *T. kok-saghyz*, *T. multiscaposum*, *T. serotinum* and *T. bessarabicum*, all diploid, sexually-reproduced species. Efforts to use various parthenogenetic polyploids as male parents failed. The successful hybrids showed a regular meiosis with 8 bivalents, but pollen grains and embryo sacs subsequently degenerated, giving complete sterility. It is concluded that distant hybridization is not promising as a method of breeding *T. kok-saghyz*, since it does not lead to the production of parthenogenetically reproduced forms.

203. Poddubnaja-Arnoldi, V. 633.913:575.127.2:581.3:581.162.5
Embryogenesis in remote hybridization in the genus *Taraxacum*.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 382–85.

The causes of sterility in *Taraxacum* hybrids are discussed and the course of embryo development in certain hybrids involving *T. kok-saghyz* described.

204. Koroleva, V. A. 633.913:575.127.2:581.6
Interspecific hybridization in the genus *Taraxacum*.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 174–76.

Hybrids of *T. kok-saghyz* x *T. multiscaposum* were found to occur in populations of *T. kok-saghyz*. They should be rigidly excluded, since it was shown that back-cross progenies of such hybrids may resemble *T. kok-saghyz* morphologically and yet yield little or no rubber.
Hybrids between *T. kok-saghyz* and the diploid species *T. karatavicum* were obtained but hybridization with parthenogenetic species was impossible.

CAMPHOR PLANTS 633.95

205. Holubinsky, J. N. 633.956:576.356.5
(New experimental tetraploid specimen of *Ocimum canum* Sims).
J. Bot. U.R.S.S. 1939 : **24** : 104–07.

Cytological examination of the callus formed after decapitation revealed the presence of haploid, triploid and tetraploid cells in addition to the normal diploids. Root tips of cuttings taken from the adventitious shoots showed two out of seven of them to be entirely tetraploid, while one more was a mixture of diploid and tetraploid tissue. From one of the tetraploid cuttings a tetraploid plant was obtained, differing from the diploid in the greater pubescence of leaves and shoots, which emitted a much more pronounced odour of camphor and are thought to have a distinctly higher camphor content; the internode length appeared to be less than in the diploid. The flowers were all sterile.

FRUIT TREES 634

206. Khašba, L. Kh. 634:575.252
(Collection and study of somatic mutations).
Sadovodstvo (Horticulture) 1939 : No. 7 : 28–30.

Reference is made to work on the subject by Shamel and by Michurin and to its practical importance.

207. Trebushenko, P. D. 634.11:575.113.4.061.6:581.47
Inheritance of anthocyanine coloration in apple-tree. (A contribution to the problem of breeding red-fruited and red-fleshed varieties of apples).
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **23** : 939–43.

Types showing red pigmentation in all plant parts which could therefore be classified in the seedling stage were used. Red coloration was found to be due to two complementary genes, *F* and *M*, *F* being a basic gene in the presence of which the gene *M* determines anthocyanin production. The red forms studied all proved to be *FfMm*, while the green forms were either *ffmm*, *Ffmm or FFmm*. Crosses between green forms never gave reds in their progeny.
It is suggested that the synthesis of *FFMM* forms would be a useful step in breeding red apple varieties.

208. 634.11:575.247
Natividade, J. V. 634.13:575.247
Mutações somáticas em variedades Portuguesas de pomóideas. **(Somatic mutations in Portuguese varieties of pome fruits).**
Agron. Lusitana 1939 : **1** : 7–21.

A mutant of the pear Carapinheira is described. It is 15 to 20 days later in reaching fruit maturity, and the fruits are distinctly larger than those of the normal variety (130–140 grm. as compared with 80–100), both of which differences are in its favour. Like all larger fruits however the flavour is slightly less rich. Three trees of the mutant form, all grafts, were found and it is presumed that they all came from a bud sport on the parent tree. In all other characters the mutant does not differ from the original variety and its characteristics are transmitted to its vegetative offspring.
In the apple Casa Nova de Alcobaça, the fruits of which vary in the extent of the red striping, three mutants have been observed; one has uniformly red fruits, with stripes of deeper colour, another is uniformly red without stripes and the third is almost colourless. The first is deemed to be superior to the unmutated form, the other two are definitely inferior and illustrate the care that is necessary in the selection of wood for grafting.

209. 634.11:576.356.5:575
*Nilsson-Ehle, H. 634.972.3:576.356.5
Framställning av tetraploida äppelsorter och dess betydelse för Sveriges äppelodling. (**Account of tetraploid apple varieties and their importance in Sweden's apple cultivation**).
Sverig. Pomol. Fören, Årsskr. 1938 : **39** : 57–69.

The work and methods of producing triploid and tetraploid varieties of apples for Swedish requirements are described. The aim in view is good keeping quality, combined with other desirable properties such as productivity, size, taste and disease and cold resistance. The Boskoop Belle and Blenheim, two valuable late maturing triploid forms grown in southern Sweden, have been used for study and five tetraploids have already been obtained and will serve as scions on specially suitable stocks and be used ultimately for crossing with diploids to produce triploid forms.

The leaf characteristics of diploids, triploids and tetraploids have been recorded.

Whether the Boskoop Belle variety is specially prone to form unreduced egg cells is a question which is receiving attention.

Müntzing's conclusions on the higher vitamin C content of triploid experimental material have been confirmed but at the same time deviations in this respect are recorded in curves for the vitamin C content of triploid and diploid forms, with observations on the genic basis of this character and its relation to polyploidy. Selection from crosses between Golden Noble (a diploid with a specially high vitamin content) and the new tetraploids might well lead to a further increase in the vitamin C content.

Experiments, still in progress, have not so far supported the view that triploids are inferior to diploids in cold resistance. The general relation between polyploidy and cold resistance is to be investigated in the new polyploid segregates from the various crosses obtained.

As triploidy carries with it a tendency to increased fruit size this characteristic must be checked by making suitable combinations in hybridization.

The potential advantages are mentioned of the increased number of chromosomes and possible gene combinations when tetraploid material is used for breeding.

The possible application of the results to forest tree breeding is suggested.

210. Kudagovskii, V. A. 634.11:581.165.711:581.165:575.12
(**Breeding vegetatively reproduced rootstocks**).
Sadovodstvo (Horticulture) 1939 : No. 5 : 14–17.

One-year-old seedlings of certain apple varieties when cut down and earthed up proved capable of forming a vigorous root system and serving as rootstocks. They were also grafted on to a mature variety and cuttings taken from them later gave a still better root development. Crosses were made of cultivated and crab apples with paradise type VIII. By using *Malus Sargenti* Rehd., which grows on saline soils in Japan, it is hoped to obtain rootstocks suitable for saline conditions. The same applies to *M. pumila*, some forms of which are easily reproduced vegetatively.

211. Heilborn, O. 634.11:581.331.23:581.162.5
Pollen tube growth in apple styles after inter-varietal cross-pollination.
Lantbruks-Högskolans Annaler, Uppsala 1939 : **7** : 171–83.

Observations on pollen tube growth in ten different cross-pollinations of apple varieties show that they fall into three groups. In the first group of pollinations the pollen tubes grow rapidly down the styles, in the second the rate of growth is moderate while in the third the distribution of pollen tube ends in the style is bimodal, the majority stopping just below the stigma and only a few getting as far as the ovary. The first group would be expected to be more fertile than the second and the second more fertile than the third. Such data as are available on seed setting in these particular pollinations confirm this expectation. J. L. F.

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* A translation of this paper is on file at the Bureau.

212. 634.11:581.481:578.08
VEH, R. VON 634.25:581.481:578.08
Über Entwicklungsbereitschaft und Wüchsigkeit der Embryonen von Apfel, Pfirsich u. a. **(Capacity for development and growth of embryos of apples, peach, etc.).**
Züchter 1939 : **11** : 249–55.

A number of apple embryos removed from the seed and receiving periodic applications of water over a period of three years germinated at quite irregular intervals over that period, a few of them remaining ungerminated but alive even at the end; the length of the rest period appears to be influenced by the endosperm and not by the embryo itself. Various examples are given of healthy peach trees that have been produced by removing the embryo immediately the fruit becomes ripe and germinating it at once. No deleterious effects from the absence of rest period were detectable.

213. 634.13:576.16:581.9
RUBZOV, G. A. 634.13:575.127.2
Polymorphismus and centers of formation of *Pyrus* species in the U.S.S.R.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 81–84.

The author recognizes two centres where the genus *Pyrus* is highly polymorphic; southern Armenia and western Tian-Shan. Five new species from southern Armenia are referred to: *P. Voronowi*, *P. elata*, *P. Medvedevi*, *P. mutans* and *P. complexa*. Many natural interspecific hybrids were found in both centres.

214. FILOSOFOVA, T. P. and
ENIKÉEV, Kh. K. 634.22:575.127.2
(Michurin's blackthorn x plum hybrids and the prospects of utilizing them in breeding).
Sovetskaja Botanika (Soviet Botany) 1939 : No. 2 : 29–38.

The hybrids of *Prunus spinosa* with the greengage have inherited such characters as frost resistance, disease resistance and freedom from shedding from the blackthorn; one of them bears fruit of good size and flavour, is quite fertile and gives a good yield of fruit every year. This hybrid proved to have $2n = 48$ as opposed to the others where the number was $2n = 40$; the meiotic irregularities were less pronounced and the amount of abortive pollen was not more than 1 per cent. Natural hybrids of *P. spinosa* x *P. domestica* and artificial hybrids made in 1935 all had $2n = 40$ and resembled the Michurin $2n = 40$ hybrids. These hybrids when back-crossed with greengage produced two seedlings of the cultivated type, one having $2n = 48$ and the other $2n = 42$. From open pollination of the Michurin hybrids, which were growing in the vicinity of many domestic plums, seedlings with chromosome numbers of 42, 43, 45, 47 and 48 were obtained. They were all plum-like or intermediate in type.
Michurin's 48 chromosome hybrid is thought to be a back cross of the above type, an F_1 natural hybrid having been used instead of a pure blackthorn as parent. The relative frequency of these balanced 48 chromosome forms in the back-cross progenies is regarded as very favourable from the breeding point of view and the repetition of the crosses on a large scale is recommended.

215. CRIST, J. W. 634.23:575.247:575.22–181:581.45
Variation and correlation in bud mutants of the Montmorency cherry.
J. Agric. Res. 1939 : **59** : 393–95.

The vegetative progeny of a barren bud mutant limb of a Montmorency cherry tree contained entirely normal and entirely mutant trees as well as trees of mixed constitution. There was a slight indication that there was greater variability in leaf area in the mutant than in the normal branches but the results were not significant. Mutant branches appeared to have larger leaves than normal.

216. 634.25:575(73)
BLAKE, M. A. 634.25:575.11
A quarter century of peach breeding.
Amer. Fruit Gr. 1939 : **59** : (3) : 9, 22–23, 26–27.
Characters found to be dominant are white flesh, red flesh colour around the pit, watery melting flesh, pubescence of fruit, small size of fruit and certain tree habits. A promising new variety Golden Jubilee has been produced by crossing Greensboro with Elberta; Sunbeam, a variety free from catechol tannin, comes from the cross Slappy x Dewey; other improved varieties are in the making.

217. 634.25:575(74.9)
New twentieth century peaches bred and tested in New Jersey.
N.J. Peach Coun. New Brunswick 1939–1940 : Pp. 12.
Descriptions are given of nine new peach varieties (Raritan Rose, Triogem, Golden Globe, Sunhigh, Goldeneast, Pacemaker, Summercrest, White Hale and Afterglow) and one new nectarine (Garden State) bred at the New Jersey Agricultural Experiment Station.

218. 634.25:575(74.9)
Two peaches are named.
N.J. St. Hort. Soc. News 1939 : **20** : p. 1148.
Variety N.J. 71, now named Fireglow, has large, yellow-fleshed fruit of excellent quality. It is not sufficiently winter-hardy for northern conditions but has performed very well at Beltsville, Maryland and other points in the South.
Pacemaker (formerly N.J. 99) has large, good quality, yellow-fleshed fruit ripening immediately after Goldeneast. It is the best variety of its season tested in New Jersey.
Both varieties were bred at the New Jersey Agricultural Experiment Station.

CITRUS FRUITS 634.3

219. 634.3:575(91.4)
TORRES, J. P. 634.3:575.127.5
Progress report on citrus hybridization: propagation.
Philipp. J. Agric. 1939 : **10** : 95–119.
An account is given of the methods of planting and propagation of citrus hybrids and a list of the hybrids being grown is given in an appendix. In all there are 72 crosses represented, consisting of 49 intraspecific and 23 interspecific crosses, of which 44 intraspecific and 13 interspecific crosses have been planted in the testing orchards of the Lipa Coffee-Citrus Station and the Los Baños Economic Garden.
By top-working, fruits have been obtained in four years. From the cross Szinkrom x Batangas mandarin the hybrid Szibat No. 2 has been obtained, combining the pleasant flavour and aroma of Batangas with the strong attachment of Szinkom. About 1,000 budded plants of this hybrid have been distributed to different parts of the Philippines and it is recommended as a substitute for the poor quality Szinkom in commercial citrus plantations. J. L. F.

220. TOPURIDZE, E. M. 634.3:581.162:575.12:578.08
(Biology of citrus blossoming as a basis for hybridization methods).
Bull. Batum Subtrop. Bot. Gdn 1937 : No. 2 : 3–39.
Descriptions are given of the structure of the inflorescence and of the flowers. Experiments on pollen germination showed a 15 per cent sugar solution with 0·25 to 0·5 per cent of agar agar to be the most suitable medium for most forms. Pollen can be preserved in a viable state for over three months. The time at which the stigma became receptive varied in the different species and forms; the receptivity was retained for almost 140 days. The author's methods of emasculation and hybridization are described.

221. Brieger, F. G., Moreira, S. and Leme, Z. 634.31:575(81) 634.31:575.252
II. Estudo sobre o melhoramento da laranja Baía. **(II. Study on the improvement of the Bahia orange).**
J. Agron., S. Paulo 1939 : **2** : 161–82.
In continuation of the earlier study (cf. "Plant Breeding Abstracts", Vol. IX, Abst. 1186) an analysis of variance was made on the diameter of the fruits of 44 trees. Indications of bimodality were observed in the variation in fruits of individual trees, lending support to the view that the clone is impure as a result of bud mutation; otherwise the results were similar to the preceding year; some trees yielded more than in the previous year and others less, four trees continued to give large numbers of relatively small fruits of the Araras type, which is regarded as the most profitable type to grow.

VARIOUS SMALL FRUITS 634.4

222. Traub, H. P. 634.42:581.481
Polyembryony in *Myrciaria cauliflora.*
Bot. Gaz. 1939 : **101** : p. 233.
From one to six (usually two) embryos were found in seeds of the jaboticaba (*M. cauliflora* syn. *Eugenia edulis*), a new fruit crop that may be promising for sub-tropical regions in the United States. Morphological studies are being made to trace the origin of the supernumerary embryos.

SMALL BUSH FRUITS 634.7

223. Rosanova, M. A. 634.711:576.16
Evolution of cultivated raspberry.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 179–81.
Cultivated raspberries differ from the wild species *Rubus vulgatus* and *R. strigosus* (both of which belong to the conspecies *R. Idaeus*) in their larger fruit size, greater polymorphism, larger number of recessive types, the presence of triploid ($2n = 21$) and tetraploid ($2n = 28$) types and in being self-fertile. They have arisen relatively recently as a result of hybridization and selection.

224. 634.711:576.356.5:576.354.4
Rozanova, M. A. 634.711:575.127.2:576.354.4
Rôle of autopolyploidy in the origin of Siberian raspberry.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 58–60.
Evidence is presented that the tetraploid races of *R. Idaeus* from Siberia and the Far East (all of which are referred by the author to *R. sachalinensis* Léveillé) are autotetraploid. The modal arrangement at meiosis was $3_{IV} + 8_{II}$ and the disjunction numerically regular. The percentage of abnormal pollen ranged from 3 to 32.
Crosses between diploid raspberries (*R. Idaeus* ssp. *vulgatus*) and *R. sachalinensis* usually showed 3-4 trivalents, though apparently the number was sometimes as great as seven, indicating that the two genoms of *R. sachalinensis* are homologous. The pollen of the triploids was 95 to 98 per cent abnormal.
It is suggested that *R. sachalinensis* arose by chromosome doubling in *R. Idaeus* ssp. *strigosus*. The bearing of these results on breeding raspberries for Siberian conditions is discussed.

225. Hahn, G. G. 634.72–2.452–1.521.6:575(73)
Blister rust susceptibility studies of naturally pollinated seedlings of the immune Viking currant.
J. For. 1938 : **36** : 737–47.
Sixty-seven (3·7 per cent) of 1,835 seedlings of the Viking red currant (syn. Rød Hollandsk Druerips) tested were susceptible to blister rust (*Cronartium ribicola*). It is believed that these seedlings were all the result of selfing or crossing between different Viking bushes. The susceptible seedlings were with two exceptions greatly lacking in vigour even before infection.

226. MILLER, J. C. 634.75:575(76.3)
Strawberry breeding in Louisiana.
Amer. Fruit Gr. 1939 : **59** (3) : 11, 24, 28.
The cross Blakemoore x Klondike has produced the greatest number of promising seedlings as regards resistance to leaf spot (*Mycosphaerella fragariae*) and scorch (*Diplocarpon Earliana*).

VITICULTURE 634.8

227. 634.835:575(73)
634.835:608.3
Amerikanische Pflanzenpatente Nr. 195, 145–155. (**American plant patents Nos. 195, 145–155**).
Züchter 1939 : **11** : 255–57.
No. 195, a vine with vigorous growth and very sweet fruits, selected from the variety Niagara, possibly pollinated by Brighton or Concord.

228. OLMO, H. P. 634.835:575(79.4)
Breeding new grape varieties.
Wine Rev. 1939 : **7** : 8–10, 32.
The technique of grape breeding is described in simple terms. The chief objects of grape breeding in California are stated as the production of (1) improved varieties for making distinctive wines of high quality, rather than imitations of European wines, (2) seedless table grape varieties and (3) rootstock varieties suited to local conditions.

229. 634.835:575.127.2
SCHEU, H. 634.835–2.411.4–1.521.6:575.116.7
Beobachtungen an F_2-Populationen interspezifischer Rebenkreuzungen. (**Observations on F_2 populations of interspecific vine crosses**).
Züchter 1939 : **11** : 225–29.
Examinations of both unselected material and material selected for resistance to *Plasmopara viticola* showed that in the F_2 of the cross Gamay x Riparia (from 595 Oberlin) a greater number of male and hermaphrodite plants occurred in the resistant classes than in the susceptible, which latter were composed chiefly of female plants. Similar results were observed in the F_2 Aramon x Riparia (from 143 AMG), except that in this cross the hermaphrodites reacted similarly to the females, not the males.
In the above two crosses no correlation was observed between resistance and fertility (number of inflorescences per plant). Low fertility was dominant and conditioned by a number of factors. In the cross Mourvèdre x *V. rupestris* monofactorial inheritance occurred.
Form of the bunch and closeness of spacing of the fruits were inherited independently, both characters being conditioned by a number of genes.

230. LATTIN, G. DE 634.835:576.16
Über den Ursprung und die Verbreitung der Reben. (**The origin and distribution of the vines**).
Züchter 1939 : **11** : 217–25.
An examination of the existing *Vitis* species shows the presence of three groups, the N. American, the W. Asiatic and a third group represented in both hemispheres. This situation is explained on the assumption that the genus is a preglacial relic. The eastern and western groups of American species, distinct in ecological characteristics, correspond with the character of the Mexican and the Atlantic coastal relic floras respectively. The Labruscae, though now only found in America, have a distribution and many characters similar to the group common to the two continents and both are regarded as of Asiatic origin. The Viniferae were apparently preserved separately in the Mediterranean and Armenian relic centres, which led to the formation of two sub-species, *silvestris* and *caucasica*, differing mainly in ecological characters; the latter is thought most likely to have given rise to the cultivated vine *V. vinifera* ssp. *sativa*. The study of the existing populations in the S. Caspian area, which is

undoubtedly the gene centre for this sub-species, is therefore of particular interest, both from the theoretical and practical viewpoints.
It is pointed out that Vavilov's gene centres correspond very closely in location to the areas of preglacial relics and it is suggested that the concentration in these areas in the glacial periods of numbers of types previously scattered over whole continents is quite sufficient to account for their having become centres of gene distribution and form development.

231. Bethmann, W. 634.835:577.8:575.11
Untersuchungen über die Vererbung der Geschlechtsformen der Weinreben. (**Investigations on the inheritance of sex forms in grape vines**).
Kühn-Arch. 1938 : **48** : 125–67.

The various kinds of flowers that normally occur in the vine are described and figures are given showing the variation in the proportions of the different types in dependence on external conditions. The degree of variation is not the same for all varieties.
Observations were made on 50,333 seedlings, of which 861 bore hermaphrodite flowers, 2270 male and male-hermaphrodite and 1902 female flowers. The results of the individual crosses are tabulated. The author concludes that hermaphroditism is the primitive condition in *Vitis* sp. and that the other forms are derivatives. In *V. vinifera* some hermaphrodites bred true on selfing, others segregated into 3 hermaphrodite: 1 female. Crosses of the second type with females gave typical back-cross ratios of 1:1 female and hermaphrodite. This is explained by the segregation of a pollen inhibiting gene *P* which in the homozygous condition suppresses the formation of fertile pollen and produces a female plant. To explain the segregation of only male and female forms in crosses of the American species it is further assumed that these species contain another inhibitor *N* which suppresses the gynaecium and that *N* and *P* never occur together, both being mutants of the original *pn* which are closely linked. The double heterozygote *Pp Nn* thus produces only two forms of gametes. For the varying degrees of maleness and femaleness existing in hermaphrodites the existence of two intensifying factors is postulated.
Indications are given of the parental combinations likely to produce the highest proportion of hermaphrodite seedlings – for breeding direct producers—and the lowest proportion—for breeding rootstocks.

232. Scherz, W. 634.835:577.831:581.162.32
Sind selbstfertile hermaphrodite Weinreben obligat autogam? (**Are self-fertile hermaphrodite vines obligatory self-pollinators ?**)
Züchter 1939 : **11** : 244–49

When inflorescences of three hermaphrodite varieties of *Vitis vinifera* were enclosed in bags containing pollen of other varieties, up to 14 per cent of hybrid seedlings were produced, of a type resembling those produced by artificial crossing with the same varieties after emasculation, and not found in the populations obtained from artificial selfing. The actual degree of cross-pollination seems to vary in different varieties.

233. Breider, H. 634.835–2.7–1.521.6:581.45
Morphologisch-anatomische Merkmale der Rebenblätter als Resistenzeigenschaften gegen die Reblaus, *Phylloxera vastatrix* Planch. (**Morphological and anatomical characters of vine leaves as indications of resistance to *P. vastatrix* Planch**).
Züchter 1939 : **11** : 229–44.

A series of observations on the number of parasites and of galls present at different stages in a number of varieties and hybrids, showed that certain forms in which the young shoots and leaves were intensely hairy almost or entirely escaped infestation in the early stages. The hairs on the young leaves present a purely mechanical obstacle to the parasite, which becomes established only on the older, less hairy leaves. This protection is effective against all phylloxera biotypes.
The leaves of many *Vitis vinifera* forms without this hairiness, while being readily infested in the greenhouse, remain practically free in the field. The present observations show that the

whole leaf structure is much coarser in the field, especially the cuticle, which is several times thicker in field plants The wild American species and most of their hybrids do not show such pronounced structural differences between field and greenhouse plants and are also found to be no more resistant in the field than inside.
In discussing the bearing of these findings on practical breeding problems the need for carrying out selection on field-grown plants as well as greenhouse plants is pointed out, together with the desirability of obtaining resistance through morphological rather than physiological characters, which apparently have an adverse effect on quality. Though such forms are resistant only in the stem, the defect can be overcome by grafting on to resistant stocks. There are indications of the existence of mechanical resistance in the roots of certain forms too.

FORESTRY 634.9

234. KOEHLER, A. 634.97:575
Heredity versus environment in improving wood in forest trees.
J. For. 1939 : **37** : 683–87.
It is pointed out that the wood is one of the most conservative elements of the plant, few differences being visible in many cases between distinct species or even genera. Therefore it would appear that breeding for wood characters is not promising, and breeding for such characters as resistance to drought, pests, frost and fire, form of tree, rate of growth and possibly figured wood would be more likely to lead to results.
A list of characters of economic significance in trees is given, with indications as to whether they are influenced by heredity or environment or both.
For breeding work, parents and hybrids should be grown together in uniform conditions. Unfortunately wood characters cannot at present be estimated until the tree is of considerable age and there is a great need for methods by which the quality of mature wood may be determined from young trees.
The characters of quickly grown trees are listed and it is concluded that the object of breeding should be to obtain the maximum vigour of growth consistent with the requirements of cultivation and utilization.

235. SCHREINER, E. J. 634.97:575:581.5(73)
Some ecological aspects of forest genetics.
J. For. 1939 : **37** : 462–65.
The importance of ecological knowledge to the forest geneticist in selecting parent trees or making selections of or within progenies is stressed. Reference is made to the ecological observations made on a block of 13,000 hybrid poplars by the North-Eastern Forest Experiment Station, prior to selection.

236. LITTLEFIELD, E. W. and
ELIASON, E. J. 634.975:575.127.2
Observations on a plantation of Dunkeld hybrid larch in New York.
J. For. 1938 : **36** : 1188–92.
Growth data on a plantation of larch trees derived from seed collected from *Larix Kaempferi* trees at Dunkeld, Scotland, are given. Three genetic types were recognized in this plantation, including undoubted hybrids of *L. Kaempferi* x *L. decidua* which appear to exhibit hybrid vigour.

237. STOUT, A. B. 634.975:575.242.061.1
The Redding hemlock tree.
J. N.Y. Bot. Gdn 1939 : **40** : 233–35.
A mutant hemlock (*Tsuga canadensis*) with a compact habit of growth is described. Growing near it are seedlings some of which are of the mutant type and some intermediate.

238. Mirov, N. T. and Stockwell, P. 634.975:576.356.5:581.04
Colchicine treatment of pine seeds.
J. Hered. 1939 : **30** : 389–90.
Partially polyploid seedlings were obtained by colchicine treatment and the usual effects of such treatment were observed cytologically. It may be possible to produce stable polyploid plants for use in breeding.

VEGETABLES 635

239. Leggieri, L. 635.25:575.42:581.6
Selezione di alcune varietà di cipolle da serbo. (**Selection of certain varieties of onions for keeping**).
Servizio delle Sementi 1939 : 53–70.
Types with round, pear-shaped and flask-shaped bulbs were selected in the three varieties Montoro, Rocca and Tropea. Experiments showed that very few seeds were formed after bagging, and spatial isolation is recommended for the production of pure seed. Single plant selection resulted in an increase in uniformity and size of bulb and a reduction in bolting.
Similar work has been started on the varieties Rameica di Piedimonte and Bassano.

240. Jannaccone, A. 635.35:575.42(45)
Selezione del cavolfiore Gigante Tardivo di Napoli. (**Selection of the cauliflower Gigante Tardivo di Napoli**).
Servizio delle Sementi 1939 : 71–88.
Plants reaching commercial maturity between the 10th and 20th March, with heads of good shape, colour, weight and compactness, ample dark green leaves closely enfolding the inflorescence and short stems were selected and bagged. From among 2,000 seedlings of the selected plants only 49 were ultimately retained as really promising. The selections produced a much higher proportion of "perfect" heads than unselected lines.
In consequence of the reduction in seed formation resulting from bagging, spatial isolation is recommended in its place.

241. Araratjan, A. G. 635.41:576.312.332
Heterochromosome in the wild spinach.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 56–57.
The female plants of *Spinacia tetrandra* have six pairs of chromosomes, including one pair of equal chromosomes with median centromeres. In the male plants there is a pair with median centromeres one of which is like those found in the female, while the other is about 1·75 times larger.

242. Gentcheff, G. and Gustafsson, Å. 635.41:576.356.5:576.354
635.41:576.312.36:537.531
The double chromosome reproduction in *Spinacia* and its causes. I. Normal behaviour. II. An X-ray experiment.
Hereditas, Lund 1939 : **25** : 349–58, 371–86.
In the periblem of roots of germinating spinach seeds, cells with 12 chromosomes are found and also cells with 12 close pairs of chromosomes, 24 single chromosomes, 24 pairs, 48 single chromosomes and 48 pairs. Studies of normal prophase material and of the types of chromosome fragments found in X-rayed material indicate that the cells with 12, 24 or 48 pairs of chromosomes originate from cells with the same number of single chromosomes as a result of the occurrence of two successive chromosome "splits" in the resting nucleus just before the onset of prophase. Cells with 24 or 48 single chromosomes are the result of an additional mitosis in cells which contained 12 or 24 close pairs in the division immediately following chromosome reduplication. Intermediate grades of somatic pairing also occur, owing to the partial retention by chromosomes of their relative position in successive mitoses.
There is evidence that tetraploid cells are already present in the periblem in the resting seed.

It is suggested that the chromosome reduplication is a result of the accumulation of specific substances in the cytoplasm following an increase in cell size. Cells with paired chromosomes are intermediate in size between those with the undoubled chromosome number and those with the doubled number of unpaired chromosomes.

243. JANNACCONE, A. 635.61:575.42(45)
Selezione del popone invernale di Capua (varietà "Palermitano"). [**Selection of the winter Capua melon (variety "Palermitano")**].
Servizio delle Sementi 1939 : 89–99.

The melons at present cultivated are extremely heterogeneous and data are given on the variation as regards type of flesh, flavour, sweetness and aroma; variation was observed also in the time at which the fruits attained maturity, which varied from the middle of December to the middle of March. Selections were made of those having the best combinations of characters. The keeping capacity proved to be very susceptible to environmental influence and its hereditary transmission was difficult to establish.
Eighteen promising lines were selected.

244. FILOV, A. I. 635.61:581.162.31:577.83
(**Reaction of hermaphrodite varieties of cucurbits to self-pollination**).
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1939 : No. 12 : 6–10.

The majority of melons and water-melons bear hermaphrodite flowers whose pollen is fertile and capable of effecting self-fertilization, the course of which is described.
A hermaphrodite water-melon Želto-Koryi with yellow rind and leaves was sown in propinquity with a hermaphrodite variety Krasavčik with green rind and leaves. Green being dominant to yellow it was possible to determine the amount of cross-pollination at different distances. This fell from 19·0 per cent in adjacent plants to 0 per cent at a distance of 100 m, which distance is therefore considered adequate for spatial isolation. Even at a distance of 10 m only 0·7 per cent of hybrids were produced.

245. 635.611–2.484–1.521.6:575(77.6)
CURRENCE, T. M. 635.64:575(77.6)
Methods and results of melon and tomato breeding work at the Minnesota Experiment Station.
Trans. Ia Hort. Soc. 1938 : **73** : 268–71.

Efforts are being made to produce an improved, early musk-melon resistant to *Fusarium* wilt. Inbreeding and selection has been carried out on the progeny of a supposed hybrid of Honey Dew x Golden Osage. Three promising strains have been developed and seed supplies are being increased. The selection 11–37 is outstanding in its high sugar content and has very firm fruit, but it has green flesh, whereas yellow flesh is preferred on the market.
With respect to tomatoes, efforts are being made to combine the high quality of Rutgers with early ripening, and early forms are being repeatedly back-crossed to Rutgers. After four generations of back-crossing some progress has been made, but it appears that if the earliest plants are selected, quality is sacrificed.

246. PANGALO, K. I. and
GOLDHAUSEN, M. K. 635.62:575.127.2:575.114
Interspecific hybridization in the genus *Cucurbita*.
C.R. (Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 61–64.

Successful crosses between the species *C. Pepo, C. moschata, C. maxima* and *C. mixta* are recorded and brief descriptions given of the F_1 and F_2 generations. A number of cases of transgressive segregation for such characters as length of branches, leaf size, earliness of flowering and fruit maturity, number of fruits, etc., are recorded.

247. ENIN, T. K. 635.64:575.11.061.1:581.45
Results of an analysis of segregation of tomato hybrids conducted for each family separately.
C.R.(Doklady) Acad. Sci. U.R.S.S. 1939 : **24** : 177–78.
Three to one ratios were obtained for normal v. potato-like leaf shape in the F_2 progenies of individual F_1 plants of the tomato cross Mikado x Earliana.

248. PORTE, W. S.
DOOLITTLE, S. P. and 635.64–2.484–1.521.6:575.127.2(73)
WELLMAN, F. L. 635.64–2.8–1.521.6:575.127.2
Hybridization of a mosiac-tolerant, wilt-resistant *Lycopersicon hirsutum* with *Lycopersicon esculentum*.
Phytopathology 1939 : **29** : 757–59. (Abst.).
Successful crosses were made with *L. esculentum* as the female parent. The F_1 showed dominance of the *L. hirsutum* foliage characters but the fruit was larger (2 to 2·5 cm. in diameter) and rather similar to *L. esculentum* in flavour. The reciprocal cross could not be obtained. Back-crosses to *L. esculentum* gave an ample amount of viable seed. The *L. hirsutum* form used was extremely resistant to *Fusarium* wilt and a symptomless carrier of mosaic.

249. LAMPRECHT, H. 635.652:575.11.061.6:581.48
Zur Genetik von *Phaseolus vulgaris*. XIV. Über die Wirkung der Gene *P, C, J, Ins, Can, G, B, V, Vir, Och* und *Flav*. (**On the genetics of *P. vulgaris*. XIV. On the action of the genes *P, C, J, Ins, Can, G, B, V, Vir, Och* and *Flav*.**).
Hereditas, Lund 1939 : **25** : 255–88.
The interactions of the various genes which determine seed coat colour in *P. vulgaris* are discussed on the basis of new and earlier data. There are two basic genes for colour, *P* and *Gri*, seven colour genes, *C, J, Ins, Can, G, B, V*, and *R*, and at least three colour modifiers, *Vir, Och* and *Flav*.
All *pp* seeds are pure white. Seeds with *gri gri* and *P C* are white, while with *P* and one or more of the genes *J, Ins, G* and *B* they are greyish white. In the presence of the basic genes, *Ins* gives light buff and *J* pale ochraceous buff seeds. These colours are difficult to distinguish but seeds with *J* soon darken, while those with *Ins* do not. These two genes were previously thought to be identical. The new gene *Can* gives whitish seeds with a yellowish-brown hilum margin. This is the same effect as the gene *G*, but interactions with other genes are different. With *C J*, *Can* gives the seed coat colour wax yellow, while *G* gives raw sienna. With *J* alone *Can* gives ochraceous buff and *G* gives maize yellow.
The modifiers *Vir, Och* and *Flav* act only in the presence of *C* and *jj*.
The seed coat colours of all known genotypes are tabulated, with the colours given in English and German.

250. SMITH, F. L. 635.652:575.11.061.6:581.48
Inheritance of red seed coat colour in common beans.
Amer. J. Bot. 1939 : **26** : p. 675. (Abst.).
A number of independent genes were found. The results of numerous crosses were reported, many of them difficult to interpret.

251. 635.652–2.421.1–1.521.6:575.11
DUNDAS, B. 635.654–2.421.1–1.521.6:575.11
Inheritance of resistance to powdery mildew in runner beans (*Phaseolus coccineus*), tepary beans (*P. acutifolius*), yard long beans (*Vigna sesquipedalis*) and cowpeas (*Vigna sinensis*).
Phytopathology 1939 : **29** : p. 824. (Abst.).
Resistance to strain 1 of the fungus in runner beans and to strains 2 and 3 in the tepary variety Gray Mottled, the cowpea variety Blackeye and the yard long bean is due to a single dominant gene.

Individual plants of tepary and *Vigna* reacted in the same way to both strains 2 and 3, indicating that resistance is due to the same factor. The F_2 of a resistant cowpea x a resistant yard long bean gave only resistant progeny, indicating the identity of the genes concerned.

252. 635.654–2.48–1.521.6:575(79.4)
635.654–2.6–1.521.6:575(79.4)
MACKIE, W. W. 635.654:575.11
Breeding for resistance in Blackeye cowpeas to cowpea wilt, charcoal rot, and root-knot nematode.
Phytopathology 1939 : **29** : p. 826. (Abst.).
Resistance to *Fusarium* wilt, to *Rhizoctonia bataticola* and to *Heterodera marioni* has been obtained by crossing Blackeye with the resistant variety Iron, with subsequent repeated back-crossing to Blackeye accompanied by selection for resistance. A number of varieties superior in yield, quality and disease resistance have been obtained.
Resistance to the three parasites was dominant, as also were late maturity, vigour and spread of plant, high yield, mottling and self colour in the seed. The eyed character is a simple recessive so that it can easily be retained in the true-breeding condition.

253. HOLMBERG, S. A. 635.655:575(73)
Sojaodlingen i Förenta Staterna. (**Soya bean cultivation in the United States**).
K. LantbrAkad. Tidskr., Stockh. 1939 : **78** : 261–72.
This paper contains a section in which the past and present development of soya bean selection and breeding in the United States and in Canada is briefly outlined. In spite of the difficulties of artificial pollination, breeding work is in progress by means of artificial and natural hybridization. The incidence of natural crossing however has been found to be well under 1 per cent. The variety Avoyelles which arose in the Otootan variety is noteworthy as a recent mutant form of value for cultivation.
American aims in breeding the soya bean are indicated. (Cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1656).

254. 635.656:575(77.5)
635.656–2.484–1.521.6:575
Canning peas in Wisconsin.
Bull. Wis. Agric. Exp. Sta. 1939 : No. 444 : Pp. 24.
Breeding work on canning peas in Wisconsin is being conducted with the following objectives: productions of varieties resistant or tolerant to common wilt, near-wilt, root-rot, cold, heat, drought and aphids; of varieties adapted to the quick freezing and desiccation processes; of high quality Alaska types with higher yields; of large-seeded varieties with fewer "blanks" in the pods; of better mid-season varieties and of early sweet varieties with sturdier stems.
The only canning variety at present that shows high resistance to near-wilt (*Fusarium* sp.) is Rogers K, which is unsuited to Wisconsin conditions.

255. 635.656:575.11:576.356.2:581.162.5
LAMPRECHT, H. 635.656:575.242
Translokation, Genspaltung und Mutation bei *Pisum*. (**Translocation, gene segregation and mutation in *Pisum***).
Hereditas, Lund 1939 : **25** : 431–58.
A study of the segregation of a number of genes in a series of *Pisum* crosses that showed 50 per cent sterility revealed the presence of two distinct interchange types, each forming a ring of four chromosomes in crosses with the normal type. These interchanges involved the chromosomes *R–Tl* and *V–Le* respectively. There is genetic evidence that the other chromosome involved is the same in each line, so that crosses between the two interchange types gives a ring of six. It is shown that segregation of such a ring would give plants showing partial sterility of 75, 62·5, 50 and 37·5 per cent, figures which agree well with the values found.

A cross is recorded which gave apparently normal pollen but in which only about 50 per cent of ovules developed seeds. The segregation for the gene pair *Vv* in this cross was 3 fertile *V*: 1 fertile *v*: 3 (or 4) half-sterile *V*: 0 half-sterile *v*. This is a 7: 1 or 8: 1 ratio for *V*: *v*. It is concluded that in this cross the gametes all function but that one of the four types, which carries the gene *v*, forms entirely lethal zygotes. This would give a 7: 1 ratio for *V*: *v*. In addition, zygotes homozygous for the complement of the other type of duplication/deficiency gamete may be lethal, in which case there would be an 8: 1 ratio for *V*: *v*.

A case is reported in which a mutation from *v* to *V* was accompanied by a reciprocal interchange involving the same chromosome. It is considered likely that the gene mutation was the prior event, leading to an unstable condition of the chromosome complement which in turn caused the reciprocal interchange.

It is maintained that mutation rates are higher in highly heterozygous material (e.g. F_1 hybrids) than in pure lines, a fact attributed to physico-chemical instability of the chromosome complement determined by the heterozygosity.

256. LAMPRECHT, H. 635.656:575.11.061.5:581.45
Genstudien an *Pisum sativum*. IV. Über Vererbung von Wachslosigkeit und ein neues Gen für lokale Ausbildung von Wachs, *Wsp*. (**Gene studies on *P. sativum*. IV. On the inheritance of waxlessness and a new gene for local production of wax, *Wsp*.**).
Hereditas, Lund 1939 : **25** : 459–71.

The effects and linkage relations of the genes *Bl*, *Wa*, *Wb* and *Wlo*, which determine wax formation on the vegetative parts of *Pisum*, are discussed in detail. In the case of the linkage group *S–Wb–K*, different cross-over values were obtained in different parental combinations, an effect attributed to genotypic differences between the parents.

A new recessive gene *wsp*, which determines the deposition of wax on the upper side of the leaves only, is described.

257. LAMPRECHT, H. and ÅKERBERG, E. 635.656:575.11.061.6:581.48
Über neue Gene für die Ausbildung von Testafarbe bei *Pisum*. (**On new genes for the production of seed coat colour in *Pisum***).
Hereditas, Lund 1939 : **25** : 323–48.

The inheritance of partly coloured seeds in *Pisum* is studied. Such seeds must be recessive for the basic gene *z*. Two new recessive genes, *dem* and *cal*, were found to reduce the coloured area of seeds of *Azzmpmp* constitution; *dem* gives the *deminutio* type in which there are uncoloured areas around the hilum and on the side of the seed away from the hilum, and *cal* the *calvitium* type, in which the uncoloured area away from the hilum is greater in extent. Seeds with both *dem* and *cal* recessive were of the *triangulum* type, with only a small triangular coloured area near the hilum.

In addition, a gene *pal* was studied, which in the recessive condition suppresses the colour of the seed coat. In *AZ* its effect was slight and variable, in *Az* seeds it was distinct, while in *Az mp dem cal* seeds it led to a complete disappearance of seed coat colour.

258. KURGATNIKOV, M. M. and LEBEDEVA, A. I. 635.656:581.192:575
(**Breeding peas for chemical composition**).
Proc. Lenin Acad. Agric. Sci. U.S.S.R. 1939 : No. 9 : 17–20.

Variation in protein content has been observed in different plants of the same variety, differences of 10 to 12 per cent, greatly exceeding the average difference between varieties, being frequently recorded. Since external conditions have little or no influence on this character in peas the differences are thought to be genetic and selection for increased protein content is recommended.

BOOK REVIEWS

5:030.8
6:030.8

De Vries, L.

German-English science dictionary for students in the agricultural, biological and physical sciences.

McGraw-Hill Publishing Company, Ltd., London 1939 : 19s. 9d. Pp. x + 473.

To arrive at a just decision on the claims of a technical dictionary covering the agricultural, biological and physical sciences is a difficult matter for a reviewer whose general impression must be derived from a relatively brief examination and the application of random tests, instead of the period of prolonged use, which properly should form the basis of such judgments. The present work has been compiled by the Professor of Modern Languages at Iowa State College, U.S.A., working in close collaboration with the members of its science faculty. The need for a dictionary covering such a wide range of subjects became apparent when it was realized how interdependent various branches of science have become. As the author points out, the terminology of entomology involves a knowledge of terms relating not only to embryology, cytology, morphology, genetics, ecology, but also to chemistry, physics, botany and medicine.

The number of branches of science to be studied made selection essential; nevertheless, an immense field appears to have been covered and genetical and cytological terms are well represented; and the simple and compound terms chosen for inclusion afford a good basis for elucidating other derivatives for which presumably space could not be found.

In response to the author's request for additions and corrections, it may be mentioned that random examination has revealed one error: *Burdonen* (plural) is translated by the singular "graft hybrid." Incidentally, the term *burdo* has been used in English. Also, among the meanings given for *Aufspaltung* the genetical term "segregation" does not appear.

The book includes, in addition to a list of dictionaries and other useful reference books, an excellent appendix of common (and uncommon) abbreviations used in German—a custom which might well be adopted by future lexicographers dealing with other languages, such as Dutch, whose technical and scientific literature abounds in abbreviations, some of which at first sight may prove obscure even to the Dutch reader.

The lay-out of the text is admirable and the book is compact and of portable size in spite of its scope.

Acknowledging a somewhat antiquated interest in the grammatical basis of linguistic study, the reviewer would suggest that in the next edition transitive and intransitive verbs should be distinguished (e.g. *abbekommen* and *abkommen*) so that the student's attention may be immediately directed to the fundamental differences in their use.

Lawrence, W. J. C. 575

Practical plant breeding.

George Allen and Unwin, Ltd., London 1939 : 2nd ed. 5s. 6d. Pp. 155. 34 figs. 5 tables.

The first edition of this little "guide book for the enterprising gardener and horticulturist" was reviewed in "Plant Breeding Abstracts", Vol. VIII, p. 203. Apart from the correction of a few misprints the second edition differs from the first in that the colchicine method of chromosome doubling replaces the decapitation callus method and also in a slight modification of the section in Chapter 7 on "pure lines in naturally cross-pollinated plants."

The colchicine method is much more likely to give results, especially in the hands of the type of worker for whom this book is intended and this change therefore represents a marked improvement. The same cannot be said however of the other change mentioned, as this particular section is still rather unclear and it is difficult to see why Mr Lawrence could not have given a straightforward account of the method used by maize breeders in the U.S.A.

J. L. F.

Richharia, R. H. 575:633:578.08

Plant breeding technique in recent years. (Lectures delivered at the Agricultural Research Institute, Nagpur).

Printed at the Bangalore Press, Mysore Road, Bangalore City 1939 : Rs. 2–8. Pp. vi + 73. 16 figs.

In the short space of only 73 pages the author puts forward a remarkably clear outline of the theoretical bases of modern plant breeding. After a brief treatment of the mechanism of gene segregation and the standard methods of selection and "recombination breeding", comes a section on distant hybridization and on the special methods used by the breeder to effect wide crosses—a treatment in which there is one notable omission, that of pollination in the bud stage.

The rest of the book is devoted to what the author calls non-Mendelian methods of breeding —polyploidy and its induction by decapitation, the use of twin seedlings and treatment with abnormal temperatures and chemicals, and the production of new mutations by irradiation.

A concluding chapter deals briefly with cytological technique.

The book is to some small extent marred by insufficiently careful proof reading and by grammatical errors, and some of the definitions in the glossary at the end could be improved upon. The omission of the titles of papers in a bibliography is also unfortunate, though the practice is a common one. These, however, are criticisms of the details of presentation and not of the way in which the subject matter has been selected and arranged.

Adriance, G. W. and
Brison, F. R. 581.16:633/5

Propagation of horticultural plants.

McGraw-Hill Publishing Company, Ltd., London 1939 : 20s. 0d. Pp. ix + 314. 182 figs.

The breeder of vegetatively propagated plants, particularly fruit trees and ornamental trees and shrubs, will find this handbook very useful. It will also be invaluable for teachers and students of horticultural science and for nurserymen. The whole field of plant propagation, both by seed and by cuttings, grafting, layering, etc., is covered, as well as the various phases of nursery management. There is also a discussion of the relation of grafting and other propagational practices to certain plant diseases and pests, such as the grape phylloxera and the woolly aphis of apples and pears. The book is well illustrated throughout, and the treatment is thorough and up to date, attaining that balance of practical detail and underlying principle which is so essential in a book of this kind. It reaches the high standard of production usually associated with this firm of publishers.

63(91.4)

A handbook of Philippine agriculture, issued in commemoration of the thirtieth anniversary.

Published by the College of Agriculture, University of the Philippines 1939 : Pp. v + 803. figs + tables.

This comprehensive handbook, dealing with the entire field of plant and animal husbandry, farm economics, meteorological data and so on, will be invaluable to the Philippine farmer. It contains an enormous amount of information, including for instance advice on carpentry, plumbing and even on the method of cleaning brass door knockers. Of more specific interest to the plant breeder are the descriptions of the varieties of crop plants grown in the Philippines and of the breeding work that has been done by the College of Agriculture, particularly on rice, maize, sugar cane and cowpeas. Variety trials are also reported and the whole forms a useful summary of work that has previously only been published piecemeal.

63.00.15(71)
575:633/5(71)

Fifty years of progress on Dominion Experimental Farms, 1886-1936.

J. O. Patenaude, Ottawa 1939 : Pp. 158. illus.

This report will be a fascinating one to any plant breeder. The Dominion of Canada Experimental Farms have many great achievements to their credit, most notable among them being

the production of Marquis wheat by Sir Charles E. Saunders from a cross between Hard Red Calcutta and Red Fife made in 1892. In worthy succession to this achievement is the recent work on the breeding of rust-resistant wheats. Breeding work on a great many other crops is included in this survey, and also studies in other branches of agricultural science.

MELHUS, I. E. and
KENT, G. C. 632
Elements of plant pathology.
Macmillan Company, New York 1939 : 21s. 0d. Pp. x + 493. 259 figs.

Textbooks on plant pathology are fairly numerous but one as well arranged, clearly written and up-to-date as this should be welcomed widely by teachers of the subject and by those anxious to learn its general principles.

Since the book is intended for students interested in the practical aspects of plant diseases rather than for pure botanists, the authors do not devote much space to botanical descriptions of the pathogens or to discussions of their affinities, but concentrate more upon symptoms, modes of infection and on the life histories of the pathogens considered from the point of view of control. In almost every case good illustrations of the diseased plant are given and the life history of the pathogen diagrammatized.

The introduction and the following six chapters discuss general principles—the economic and historical significance of plant diseases, the history of the science of plant pathology, the main phenomena associated with disease and parasitism, the influence of environment on disease and the principles underlying control (including a brief treatment of the significance of the breeding of resistant varieties). Then come chapters on the diseases caused by various groups of organisms—four chapters on fungous diseases, one each on diseases caused by bacteria, viruses, flowering plants and nematodes, and one on non-parasitic diseases. In each of these chapters a group of representative types is chosen for discussion. It is rather surprising how many of these types are just as important in western Europe as in the United States (where the book is primarily intended for use) and the teacher here will have to replace relatively few of the examples by forms of more strictly local importance. To take an example, of the eight diseases caused by Phycomycetes that are discussed, only two will not be of immediate practical interest to the English student.

At the end of the book is a useful glossary, a list of texts on various aspects of plant pathology and a very adequate index.

GEOFFROY, R. 633.11:664.641.016
Le blé, la farine, le pain. (Wheat, flour and bread).
Dunod, Paris 1939 : Fr. 95. Pp. 359. 24 figs. 40 tables.

In the six chapters of this book the following aspects of milling and baking are dealt with; the chemical composition of the wheat grain and its content of enzymes and vitamins; the characteristics of wheats from various parts of the world and the ways in which they are influenced by environmental factors, method of cultivation and variety; milling; methods of estimating the quality and composition of wheats and flours; fermentation of the dough and bread-making. All this matter will be of considerable interest to the wheat breeder, and particularly chapter four, in which the principles of the various methods of estimating milling and baking quality are dealt with at some length, though without any detailed descriptions or illustrations of the apparatus used.

There is a bibliography of 290 references.

ARNAUTOV, V. V. (Editor). 633.491
(The potato).
Ogiz-Sel'khozgiz, Moscow 1937 : 8 roubles 70 kopeks. Pp. 583. 111 figs + tables.

The history of the discovery and introduction of the potato is outlined, though without reference to the most recent writings on the subject. Descriptions are given of the various potato species, including the new S. American species. The anatomy and the chemical composition of the potato, its utilization, conditions of growth, photoperiodic reactions, reaction to various unfavourable conditions of growth and phasic development are discussed,

followed by sections on breeding and seed production and genetics, including extensive sections on interspecific hybridization and on vegetative mutations. The value of the new S. American species in breeding for a number of specific features such as resistance to diseases, pests and frost is discussed by references to work that has already been mentioned from time to time in "Plant Breeding Abstracts". The importance of the choice of parental material is emphasized and the value of a number of different varieties of domestic potatoes as parents is discussed.

Among the achievements in potato breeding the new Soviet variety 8670 (cf. "Plant Breeding Abstracts", Vol. VIII, Abst. 1235), characterized by frost and blight resistance, is mentioned; it has proved equal to the best standard varieties in yield, starch content and size of tubers, has withstood the effects of autumn frosts of −4° C. and has remained quite free from attack by *Phytophthora infestans* both in the field and in laboratory tests. Other blight-resistant seedlings are under observation. Further achievements of Soviet potato breeders include the production of varieties of excessive earliness by crossing with *Solanum andigenum* and varieties with high starch content from intervarietal crosses within *S. tuberosum*.

Descriptions are given of the main varieties grown in the Soviet Union.

The general sections which follow are devoted to the methods of potato cultivation, diseases and pests and their control, storage, ensilage and utilization for alcohol manufacture.

JOURNÉE, C. and
VAITZMAN, L. 633.71(49.3)

Quelques aspects du problème du tabac en Belgique. Importance économique—Technique de production. Organisation de la vente et du travail d'amélioration. (**Some aspects of the tobacco problem in Belgium. Economic importance. Technique of production. Organization of marketing and of breeding work**).

J. Duculot, Gembloux 1939 : Fr. 20. Pp. 176. 12 figs. 13 tables.

This book is a comprehensive survey of the present position of the Belgian tobacco industry, including discussion of the factors affecting the cultivation, curing and marketing of the crop. It appears to be imperative that the quality of the produce should be improved, but the problem is not a simple one that can be solved by the breeding of new varieties alone. The crop is so much influenced by conditions of cultivation and climate that nothing short of a thorough-going improvement programme with the backing of the government, the cultivator and the breeder will suffice. Proposals are made for the future conduct of research and extension work in the country, all research to be done at a central station (at present at Gembloux), which would be supported by a whole series of sub-stations. The central station would deal with breeding work, cultivation experiments, chemical studies, etc., while one of the chief functions of the sub-stations would be to run demonstration plots and generally to educate the farmer in the use of improved cultural practices.

In Chapter II the research work already accomplished at Gembloux and at the Bohan substation is summarized. An account of this work has already appeared in "Plant Breeding Abstracts", Vol. VII, Abst. 720; with respect to breeding it has been concentrated on the collection and testing of indigenous and foreign varieties, pure line selection within the indigenous forms and variety testing. Some crosses have been made and the F_1 hybrids obtained but owing to lack of space this work has not been continued.

ALEŠIN, E. I. 634:575

(**Fruit breeding**).

Sel'khozgiz, Moscow 1936 : 4 roubles. Pp. 246. 66 figs.

The basic principles of plant breeding and genetics are explained with particular reference to fruit trees, the problems connected with each type of fruit being separately outlined. The value of the wild relatives as breeding material is enlarged upon and descriptions are given of the many wild species nearly related to the main fruit trees, with indications of their value for breeding and the characters they are expected to transmit.

The technique of hybridization is described in detail and directions are given for the raising and selection of the hybrid seedlings, reference being made to the work of I. V. Michurin and a list given of his varieties and their origin.

A final chapter is devoted to the breeding of root stocks and vegetative selection.

THOMPSON, H. C. 635
Vegetable crops.
McGraw-Hill Publishing Company, Ltd., London 1939 : 3rd ed. 33s. 0d. Pp. xi + 578. 68 figs. 75 tables.

WATTS, R. L. and
WATTS, G. S.
The vegetable growing business.
Orange Judd Publishing Company, Inc., New York 1939 : $3.50. Pp. xvii + 549. 148 figs + tables.

Professor Thompson's book is the third edition of a book first published in 1923, while the second work is a new book intended by the publishers to replace "Vegetable Gardening" by R. L. Watts. Both books are up-to-date accounts of the production of vegetables and follow essentially the same plan. In each case the general aspects of olericulture are described and then the individual crops are considered. Neither of the books could be said to be strongly academic in outlook but of the two Professor Thompson's is rather the more so, while "The Vegetable Growing Business" would probably appeal more directly to the practical grower. For instance, where Professor Thompson gives the results of research work with references in the typical textbook style, the authors of the other book have chosen the course of digesting it for the reader and presenting it in the form of recommendations. This difference in the manner of presentation is probably due to the collaboration of a vegetable grower (G. S. Watts) in the second book and is further illustrated in the useful appendices of tabulated information provided.

The main differences in the matter presented are, firstly, that Professor Watts and his son devote more attention to financial aspects and secondly that in many crops they give hints and directions for the grower who wishes to raise his own seed, while Professor Thompson recommends buying seed.

Both books have bibliographies, the first having a list of references cited in the text and the second a classified list of books and pamphlets recommended for reference purposes. An adequate index is provided in each case. The high standard of each book well reflects the advanced technique of American olericulture. The choice between them is not easy and will depend largely on personal requirements. The higher price of the first is largely due to the well-known McGraw-Hill standard of production, but the second book is also well produced.

J. L. F.

KENT-JONES, D. W. 664.641.016
Modern cereal chemistry.
Northern Publishing Co., Ltd., Liverpool 1939 : 3rd ed. Pp. vii + 720. 74 figs. 124 tables.

Since the publication of the first edition of this well-known work in 1924 a great amount of new material has accumulated and the third edition, which is now before us, is quite twice the size and contains some 600 references to published scientific work, of which about half have appeared since the issue of the second edition in 1927. The third edition contains new chapters on Dough Testing Machines, on Flour for Purposes Other than Breadmaking, on Cereal and Balanced Rations for Livestock and on The Microbiology of Cereals and many of the existing chapters have been largely rewritten and extensively revised. From the point of view of plant breeders the introduction of the new chapter on Dough Testing Machines will be of most interest. In this chapter a historical review of the attempts of millers to estimate experimentally the quality of dough is given, from the machine patented in 1899 by the Scottish miller James Hogarth to the more elaborate instruments of the present day, the most popular of which, the Farinograph, is, curiously enough, based on almost identical principles. Useful descriptions and illustrations are given of the chief types of machine such as the Farinograph, the Extensimeter and many others and of their utilization, with discussions of the relative merits and demerits of each. Non-mechanical methods such as those of Pelshenke, Cutler and Worzella and Berliner are similarly treated. An earlier chapter on the nature of flour strength will serve as a valuable introduction to the subject of quality determination. There is also a chapter on methods of flour analysis.

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